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Renovation Makes Pastures Profitable ..... *Better Crops* 1
Short of Hay? ..... *American Agriculturist* 6
Schooling Draft Horses ..... *The Horse* 9
Baking Soda for Shipping Fever ..... *Cimco Fortnightly* 15
Selecting Fertilizers ..... *Eastern States Cooperator* 18
What Affects Profits? ..... *American Poultry Journal* 24
Silk Worms in the South ..... *Southern Agriculturist* 28
Producing Clean Milk ..... *Guernsey Breeders' Journal* 30
Official vs. Ordinary Milk Records, *"Dairy Cattle and Milk Production"* 33
Breeding for the Future ..... *Poultry Item* 36
Control of Stored Grain Insects ..... *Southern Planter* 40
Recovering Ranges ..... *Capper's Farmer* 42
Molasses Feeding ..... *Dakota Farmer* 45
Porker Pyramid ..... *Successful Farming* 50
Facts on Vitamin E ..... *Everybody's Poultry Magazine* 53
A New Industry for the Farmer ..... *H. C. Bartholomew* 57
The Tradition of Fox Hunting ..... *Acco Press* 61
Wintering the Flock ..... *Sheep Breeder* 64
Stationary Spraying Equipment ..... *Ohio Farmer* 68
Buying Farms on Contract ..... *Rural New-Yorker* 74
Superphosphate Magic ..... *Pacific Rural Press* 76
Contagious Abortion in Hogs ..... *Duroc News* 78
Lessons in Breeding from Beltsville ..... *Ayrshire Digest* 81
Are They Vermin? ..... *E. Lawrence Palmer* 85
For the Farmer's Library 86
Index 87

The Farmer's Digest

From more than two hundred magazines and bulletins published in this country and abroad, the Editorial Staff of the Farmer's Digest selects articles of outstanding merit and general interest. It is comprehensive in its scope, covering all phases of Agriculture.

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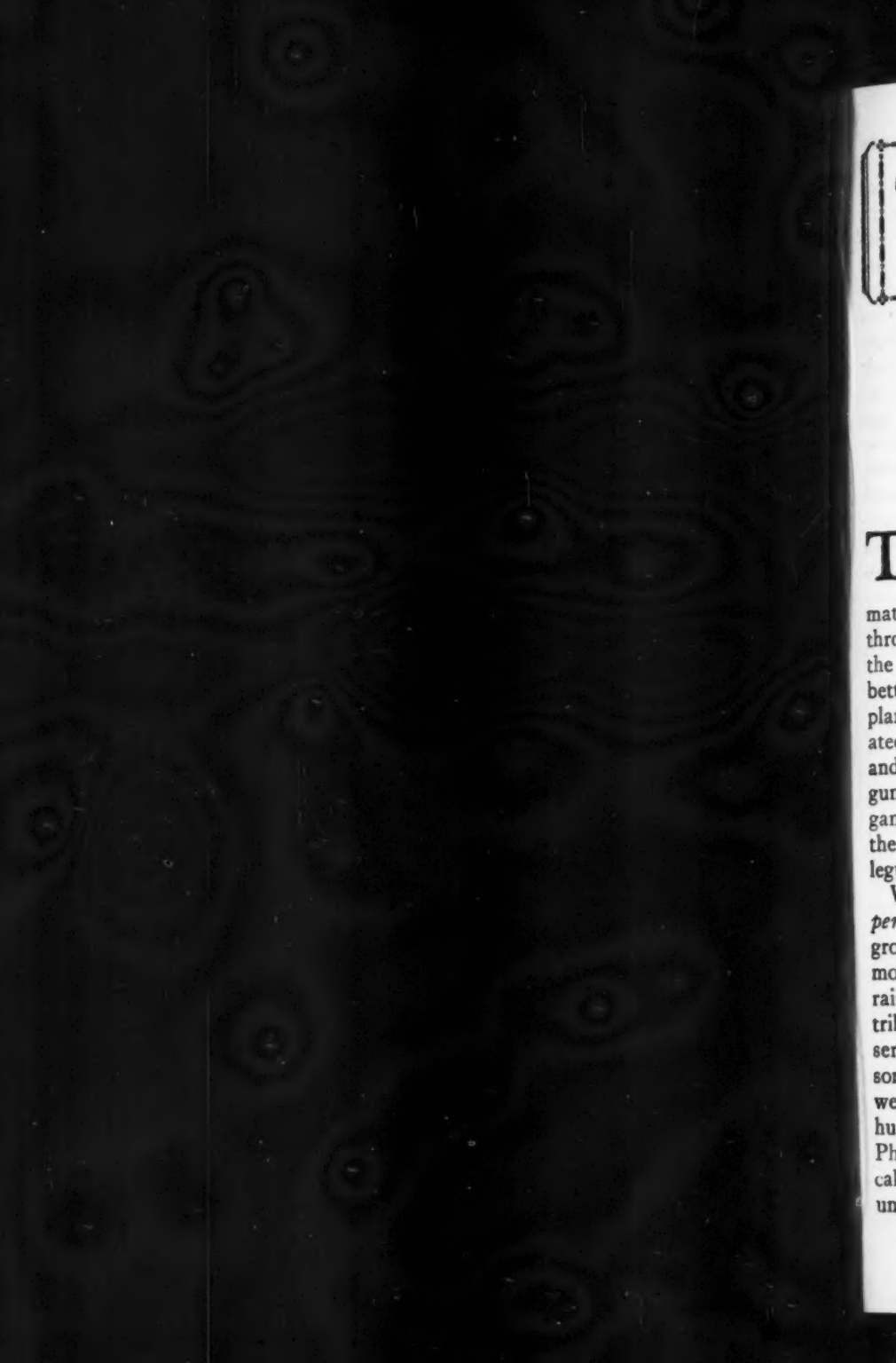

The Farmer's Digest

Volume 3 February, 1940 Number 10

Renovation Makes Pastures Profitable

Condensed from Better Crops with Plant Food

F. V. Burcalow

Wisconsin College of Agriculture, Madison, Wisconsin

TAKE care of the legumes and the grasses will take care of themselves" is axiomatic in grassland management throughout the humid areas of the world. Reciprocity finds no better illustration in the whole plant kingdom than the associated growth of desirable grasses and desirable legumes. The legumes furnish nitrogen and organic matter for the grasses, and the grasses supply shelter for the legumes.

White clover (*Trifolium repens*) is the premier legume for growth in association with the most desirable grasses where rainfall is abundant and well distributed, winter injury is not a serious problem, the growing season is characterized by cool weather, and soils are rich in humus and mineral nutrients. Physiologically and morphologically it is the ideal pasture legume under such conditions. When grazing is properly regulated, undue competition of the grasses is held in abeyance, and the survival and productivity of white clover are assured. This is a rather well-known fact.

What is not so generally known is that farmers of the north central States are solving the chronic problems of dry summer weather with legumes whose heat and drought endurance is far superior to white clover. Moreover, such legumes are being established in blue grass sods without plowing, without erosion, without the destruction of the grasses, and with benefits that are truly amazing. Not only is the carrying capacity of such pastures often doubled and trebled, and not only is succulent grazing provided during summer drought, but weeds are greatly reduced and damage from that major pest of the many grassland areas, the white grub, is practically eliminated. Such

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benefits do not prevail just for one or two years, but for several. This plan of grassland improvement was developed at the Wisconsin Experiment Station by L. F. Graber, and it is known as renovation.

Where periodic drought and heat prevail, white clover is sporadic and irregular in its contributions to the grasslands of humid regions. Granted that the soil is well supplied with potash, phosphates, and lime—the prime essentials for its welfare—white clover may persist, but it will only be productive if nature favors it with abundant, well-distributed rainfall and accompanying cool temperatures. It is not a dry-weather legume, nor is it a hot-weather legume. It is a surface feeder, and it is heir to the many ills of climatic adversity.

It is not surprising, therefore, that in the Midwest where extended periods of dry hot weather are not uncommon farmers look to such heat-resisting and drought-enduring legumes as sweet clover and alfalfa to furnish succulent pasturage when bluegrass and white clover are "siestic," dormant, and waiting for moisture to revive them.

In the major drought years of 1934 and 1936 when grasses and white clover were browned and shrivelled to the kindling point, properly managed sweet clover was tall, productive, green, and succulent, and alfalfa was not far from it in performance under the stress of such environmental adversity. No wonder, then that farmers have been growing their regular fields, biennial sweet clover and alfalfa as dry-hot-weather supplements in their grazing set-ups. No wonder, that more recently with the findings of agronomic research, they have begun to establish sweet clover, or a mixture of sweet clover and red clover, and alfalfa, or a mixture of alfalfa and red clover, in unproductive permanent bluegrass pasture sods without plowing. The practice is "taking hold" in Wisconsin and elsewhere with a remarkable degree of success.

Renovation is a first-aid treatment to grub-damaged or poor, unproductive, weedy, nitrogen-phosphate-potash-lime deficient, run-down permanent grasslands. Many of such pastures are hilly, and the soil is erodible. Plowing is hazardous and sometimes impossible. But such pasture sods can be scarified with a disk or spring-tooth harrow or both. With these implements and a drag a satisfactory seedbed can be prepared during periods when the soil contains the right amount of moisture to work up well. If weeds and old grass or other residues interfere, they can be burned off (using the usual fire precautions) in the late fall, mid-winter, or early spring. In most

pastures despite their unproductivity, there will be enough live roots and rhizomes and enough old sod incorporated in the soil to prevent erosion. The grasses are not killed, but, of course, they are weakened sufficiently to get dry-weather legumes started.

The needs of sweet clover, alfalfa, and red clover for lime, phosphate, and potash are too well known to warrant discussion. Soils deficient in one or all of them will never sustain productive growths of dry-weather legumes, and seedings are doomed to failure unless the soil needs are ascertained by soil tests and adjusted by proper applications of these essentials. Lime and fertilizer may be applied to the sods either before or during the scarification process. They should always be incorporated in the surface layer of the soil.

Many unproductive pastures are characterized by abundant growths of weeds, such as the ragweed, horseweed, and others. Because they form seed annually, enormous populations of weed seeds have accumulated in the soil and they may afford destructive competition for the young seedlings of dry-weather legumes. Such situations are handled effectively by repeated diskings or other cultivations at intervals of from 1 to 3 weeks, and deferring the seeding until the end of May or the forepart of June. In regions where August or September seedings are feasible, the weed problem is not difficult, since the dry-weather legumes become well established during a period when weeds are for the most part dormant and inactive. The dry-weather legumes are sown in the scarified grass sods in the same manner as they are sown in cultivated fields, but at rates 2 to 4 pounds heavier than normal. A nurse crop of grain is used only when the soil is so devoid of sods that erosion becomes hazardous.

Obviously, grazing needs to be withheld from the area of a pasture being renovated until the dry-weather legume seedlings are well established, and consequently this portion of the pasture must be fenced. However, when the legumes are well rooted and have abundant top growth (usually in July with spring-sown sweet clover, alfalfa, and red clover) moderate grazing can be practiced during late July, August, and early September without seriously injuring the new seeding. With the oncome of fall rains, grazing should cease, thus giving the young legume plants an opportunity to prepare for winter.

After dry-weather legumes have been successfully established, the benefits of this renovating treatment are largely dependent upon regulation of the grazing, and this is rather easily accom-

plished since the renovated area is already fenced. Excessive grazing is extremely harmful to both the legumes and the grasses. A very desirable plan of grazing areas renovated with sweet clover is to pasture closely for not more than two weeks in the spring of the second year after the sweet clover has attained a height of from 2 to 3 inches. The subsequent growth of the sweet clover and grasses is held in reserve to provide for succulent grazing during the usual dry period of July, August, and early September. Alfalfa is very sensitive to early defoliation, and grazing is often held in abeyance until blossoming or later.

Because it is widely known for its soil-enriching qualities, its great drought and heat resistance, and its aggressive growth, and because of low seed costs, biennial sweet clover (especially in mixture with medium or mammoth red clover) is being widely utilized for the renovation of permanent grasslands. When the second year's growth is so grazed as to permit seed formation, and the associated grasses are grazed very closely for the remainder of the year after the sweet clover seed has formed, it is not at all uncommon for a new stand of sweet clover to arise in renovated pastures in the third year. With regulated grazing, good stands will persist and will produce seed again in the fourth year, until the grass sod becomes so dense that seedling plants find it difficult to establish themselves.

In the famous bluegrass region of southwestern Wisconsin, four acres of an unproductive weedy pasture on a steep hillside were renovated with biennial sweet clover, and a smaller area with alfalfa in 1929. It was Graber's first attempt to ascertain the practicality of renovation, outside of the trials he had conducted previously for four years on the University Farm at Madison. Not only was this venture a remarkable success, but it was this trial that yielded the first concrete evidence that sweet clover and alfalfa repelled the egg-laying June beetle. This discovery of the Wisconsin agronomists and entomologists has since become the basis for a most effective means of white grub control.

The June beetles whose eggs hatch into white grubs prefer to do their egg-laying where sweet clover and alfalfa do not abound. The large flight of June beetles in 1929 deposited enough eggs in the unrenovated bluegrass to produce white grubs at the destructive rate of 220,000 per acre, according to counts made in 1930. In the renovated portion immediately adjacent, only 20,000 white grubs per acre were found, and such a rate of infestation is quite harmless to the pasture grasses.

The duration of the benefits of this pasture renovation of 1929 are shown by the data gathered in subsequent years on white grub and weed control. Heavy flights of June beetles occurred in 1929, 1932, 1935, and 1938. Comparing the number of grubs in the renovated and unrenovated portions of this pasture in the years immediately after the beetle flights, the populations of grubs were reduced by the renovation of 1929 as follows:

1930 .....90.9%
1933 .....87.2%
1936 .....79.2%
1939 .....70.4%

Moreover, the weed populations in the renovated bluegrass were 93.7% less in 1937, 90% less in 1938, and 78.5% less in 1939 than in the adjacent area of unrenovated bluegrass.

In 1934 and 1935, Graber renovated portions of from 1 to 33 acres of 30 thinly sodded and weedy bluegrass pastures widely distributed in southern and western Wisconsin, using biennial white-blossomed sweet clover, alfalfa, and medium red clover. In 1936, a year when white grubs were extremely destructive, there were, by actual count, from 91% to 98% less grubs on the renovated portions of these pastures than prevailed in the unrenovated portions immediately adjacent. In 1937, all weeds including ragweeds and horseweeds, which were the dominant species, were 86% less on the renovated portions.

Not only did such benefits prevail, but the sods thickened and grasses were much more productive on the renovated areas, and this situation still holds in 1939. Even where some of the renovations were excessively grazed, such benefits persisted, but not nearly to the extent in which they prevailed under moderate and regulated grazing. Renovation is not very costly when measured in terms of its long-time benefits.

Short of Hay?

Condensed from American Agriculturist

E. S. Harrison

DAIRYMEN in many sections of the Northeast face a serious shortage of hay as a result of the severe summer drought. How should this situation be met?

On farms where there is an actual hay shortage, failure to figure out a satisfactory supplemental feeding program will cause a serious drop in milk production. A large part of the cost of producing milk is fixed and remains unchanged regardless of whether the cow is producing 25 or 50 pounds per day. Because of this fact, the most economical herd production is obtained when the cows are fed liberally enough to make full use of their inherited ability to produce.

Undoubtedly the situation here in the Cornell University herd is similar to that on many other farms. Here is what we plan to do. We had a very satisfactory yield of first cutting hay, but the second and third cuttings were almost a complete failure. Short pastures from July throughout the remainder of the summer forced us to feed quite a lot of our winter's supply of hay as a pasture supplement, and we face the winter feeding period with about 60 per cent of a normal hay supply. In spite of the drought our corn crop was fairly good and our silos are all full. As a matter of fact; we have about 25 per cent more silage than we put up in a normal year. The yield was not above average; we just had more acres of corn to put into the silos.

With a normal supply of hay, we attempt to feed our cows about 1½ pounds of hay and 2 pounds of silage per 100 pounds of live weight. This year we expect to feed just under 1 pound of hay per 100 pounds of live weight and all the silage they will consume. Without question, this feeding program will slightly reduce the amount of total digestible nutrients the cows are getting from roughage. Silage is bulky and the dairy cow does not have the capacity to consume as much dry matter in silage as in dry hay. To make up for this, we plan to feed a slightly higher ratio of grain to milk.

We plan to follow a little different feeding program with our heifers. About 60 heifers that are

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housed in one barn will be fed as follows:

They will get one feeding of hay, about ½ pound per 100 pounds of live weight, and 3 pounds of silage per 100 pounds of live weight. In addition, their mangers will be filled once per day with bright oat straw. Whatever straw is refused will then be used for bedding. With this roughage feeding program we will probably have to increase the grain feeding by about 2 pounds per heifer per day over the amount of grain required to produce a satisfactory rate of growth when the heifers get all the hay they will consume.

This heifer ration will be short in calcium, phosphorus and vitamin D. To correct these deficiencies we will put 1% steamed bone meal (feeding grade), 1% finely ground limestone, and ¼% cod-liver oil concentrate in the grain ration.

We feel that hay is so important in the ration of calves under one year of age that they will be provided with all the hay they will eat regardless of cost.

In general, our feeding program this winter will be to replace hay in the ration with silage as far as is possible without seriously influencing production and the health of the animals.

Obviously, dairymen who have a shortage of both hay and silage have a more difficult problem to solve. There is nearly a normal hay crop in certain sections in New York State and the yield has been reported as good in Michigan and Ohio. Dairymen living within reasonable trucking distances from areas where the hay crop was normal, and where there is hay for sale, will probably find the purchase of hay the most economical solution.

A good quality of hay will furnish about 50 pounds of total digestible nutrients per 100 pounds. A good concentrate mixture will furnish approximately 75 pounds of total digestible nutrients per 100 pounds. In other words, it requires 3 pounds of good hay to equal 2 pounds of concentrates on a total digestible nutrient basis. Thus, when 300 pounds of good quality legume roughage can be purchased for less than 200 pounds of grain, restricting roughage is not economical. As the quality of hay goes down, more hay is required to furnish the amount of total digestible nutrients contained in one pound of grain. Since the freight rate or trucking cost is the same on a ton of poor hay as on a ton of good hay it is more economical to purchase the best grades of hay.

Regardless of the ratio between the cost of nutrients in grain and hay there is a very definite limit to the amount of grain that can be safely fed. Excessively heavy grain feeding is usually accom-

panied by an increase in udder troubles, breeding troubles, and digestive upsets. In other words, roughage can not safely be eliminated from the ration regardless of cost. If, because of economy, it becomes necessary to increase the rate of grain feeding, the concentrate mixture should be made as light and bulky as possible. Wheat bran and ground oats are two of the most bulky and safest feeds for the dairy cow. The concentrate mixture can also be lightened by feeding it with beet pulp when beet pulp can be purchased at a favorable price.

Molasses is a fairly cheap source of carbohydrates and can without question be used to advantage on many farms. It can be diluted with water and sprinkled over low grade roughage to increase palatability. By this method, cows can be encouraged to consume roughage that would otherwise be refused. It must be realized, however, that a low grade roughage is being fed and that production is likely to be somewhat lower than where a high quality roughage is fed.

Another method that might be used to apply molasses to low grade roughage would be to mount a barrel of molasses on a stand and direct a stream of molasses on the roughage as it passes through a chopper. If a large amount of molasses is applied there would be some danger of spoilage if chopped too far ahead of feeding.

In the final analysis, each dairyman must work out a solution to his own roughage problem. The proper solution will vary with each farm and also in different sections of the country, depending upon the feeds available and feed prices.

Where there is a roughage shortage, failure to provide cows with a satisfactory ration this winter will affect production over a much longer period. After a winter with unsatisfactory feeding conditions, cows will be in such poor condition that production will continue at a low and unprofitable level next summer, regardless of feeding conditions.

Schooling Draft Horses for a Better Market

Condensed from The Horse

Clarence E. Bosworth

THE work horse breeders of America could get twenty-five percent more from their drafthorse crop by devoting more time and effort to the development of their colts.

They could assure to their market an activity, permanence and security which it does not now enjoy. Executives of many large companies turn from horses to motors through necessity and with great reluctance.

The motor manufacturers study transportation. They not only meet the needs of commerce and industry, they anticipate them. But the draft-horse breeders have not done anything competent in market study or in product analysis.

"If you could convince breeders that it would pay them to teach their colts balance, responsiveness, and dexterity in the handling of their feet and legs," said the manager for one of the big metropolitan milk companies, as we walked through his stables, "you would not only make horse raising for them more profitable, but you would inject a wholly new degree of enthusiasm into the draft horse market."

We walked from stall to stall and my guide stopped frequently to point to animals, otherwise fine, which had developed unsoundness and blemishes because they went to work "good broke" but *totally unprepared for work!*

Out in the infirmary we found fine young horses that had worked, in many instances, only a few days or a few weeks. There they stood with calked coronets, enlarged tendons, quittor and whatnot, with blisters, bandages and liniments very much in evidence.

Go to auctions and see the horses as they are knocked down by the auctioneer. Fine young things they are; market fat, "good broke," and willing to stretch leather as well as they know how. They "gee" and "haw" with the awkwardness of uninstructed youth. They hang back, not because they are unwilling, but because they are confused and uncertain; they show "action" only at the crack of the whip; and they draw up panting and sweating to be knocked down to the highest bidder who hopes they'll "turn out all right."

But wait. Here's something special. In breeding, conformation, bone and size, here is a pair no better than the rest. But they

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November-December 1939

take a stance. They lift their heads in animated confidence. They move out and show a confident, easy way-of-going. They are *in balance;* and, they are *handy*. There's an extension on the forehand unusual in draft horses. They turn and stop with the dexterity of polo ponies, in balance, and their hocks are tucked well under. Heads up, eyes bright, ears active, they are animated and interested! No whip is needed to show *them* off. Evidently, they are the product of a breeder who took a tip from European breeders who produced for individual export.

Bidding starts at a reasonable figure and it goes on up to a gratifying premium price. What's the difference? Schooling! Just a little extra schooling that yielded a fine return on the little extra investment of time and effort over what is required to turn out horses that are merely "good broke." They'll go into work eagerly and contentedly because they are prepared for it; and they'll stand up against it because they know how to handle themselves in opposition to the resistance of loads as well as under the handicap of slippery, uneven footing.

What, then, is the system of schooling that can turn ordinarily good horses into premium-priced animals that will stand up year after year in service *and like it,* as they win a reputation for their breeders? That system is simple, easy to employ, and not so expensive in time and effort that it can not be employed profitably. In fact, it is so valuable that breeders of draft horses can not afford not to use it.

The system need differ little from that employed in the development of well schooled horses for sport and pleasure under the saddle, but for economy, it must be organized to demand a minimum of personal attendance. In the first place, every horse should be given a "good mouth." A work horse should go up onto the bit just as confidently as a pleasure horse. The bars of his jaws should be protected from injury and never allowed to become cold and hard. A work horse should turn at a finger touch on the rein rather than because his nose is pulled around to the turret by main strength so that he *has* to turn to relieve his cramped position. He should back at command with the same light touch on the reins, *in balance*, rather than because he is dragged back, again by main strength, so that he pushes rearward defensively, *out of balance*, and in continual threat to hocks, stifles and ankles, to say nothing of the threat of his back, loins and tendons.

"Bitting" and giving a horse a "good mouth" are easy steps in the development of a superior animal. All that are needed are

an open bridle with a rubber bit, a body-band with a back-strap and crupper, a pair of rubber or door-spring reins, and a side check. The "rig" is easily assembled from harness parts and a few snaps, rings and springs. The body-band should have a ring at the top into which the side check may be snapped, and down about eight inches on each side, should be other rings into which the side reins may be snapped. For side reins on draft colts, I like screen-door springs 3/8 inch in diameter, lengthened with straps buckled through a ring snap. The reins and side check should always be fastened with snaps to permit quick release if a young horse fights the rig when it is first put on. Also, snaps facilitate quick removal and adjustment for use on other horses.

When first put on, check and reins should be so loose that they come into play only when the horse moves his head up and down or sideways almost to the limits of natural movement. At first, let him wear the rig for a half-hour in stable or paddock until he accepts the restraints and starts to play with the bit. Then, day by day, take up on both check and reins, but *never* so tightly that the horse can not lift his head still higher or tuck his chin still more. Watch the horse in his free, animated, active moments at liberty. See where he carries his head *naturally*, and don't try to lift it any higher, nor try to tuck his chin any more than he does it *naturally* in his proudest moments.

After the horse becomes used to the rig, he may be left to himself for an hour's wearing of it, preferably in paddock or corral, where he should be encouraged to walk and trot under its restraint. In a very short time movement will become light, animated and free with gratifying action at both knee and hock. During this period, the mouth will be given its development. After a week of free bitting, the horse should be worked in a circle on a long line at the trot, always at the trot, and under control, for from ten to twenty minutes, reversing his direction at frequent intervals. This work at liberty and on the long line not only developes the mouth and forehand extension, but it makes all-important contributions to balance and way-of-going.

The second step in schooling may well be worked over the cavalletti. The cavalletti is one of the simplest, as well as one of the most amazing devices ever conceived as an aid to teaching horses to carry themselves in balance. It is just a series of logs or rails laid along the ground at intervals, as far apart as the measurement of the horse from front to hind feet when standing

squarely upon all four legs. I prefer smooth, peeled logs from fourteen to sixteen inches in diameter. If built of rails, they must be stout, rounded enough to remove sharp edges, and firmly anchored. The cavalletti should be made up of not less than fifteen logs or rails, and twenty-five are better as a minimum. Rails should enclose the cavalletti course which should be from six to eight feet wide to keep the horse moving steadily forward.

In his first traversings of the course, the horse should be allowed to take his time, pick his way, and become thoroughly familiar with it. After that, he should be encouraged to proceed at a smart walk. Eventually, he will probably move at a trot and may even leap from interval to interval. The effect of exercises on the cavalletti will be noticed almost immediately. You will see the horse's diagonal base lengthen *to the front*. You will see foreleg and hindleg cannon bones come up into a perpendicular parallel, showing that weight is being advanced onto the forehand where it belongs for balance; and you will see the heavy, ponderous way-of-going of the unschooled draft horse rather quickly transformed into the easy, airy, alert way-of-going that is characteristic only of horses that move *in balance* and with the confidence and eagerness of horses that have acquired dexterity in the handling of their feet and legs.

To save time and to permit the horses to work on the cavalletti without special attendance and management, the cavalletti may be used as the lane to and from paddock, pasture or corral, in which case the number of logs or rails may be increased to as many as forty or fifty. The horse *never* should be hurried over the cavalletti with whip or other threat to induce rapid progress. Vocal encouragement to proceed smartly is all right and so is following at a little distance, if necessary. After the first few traversings of it, most horses seem to enjoy it as a sort of game and voluntarily proceed at a much faster pace than the timid walk which marks their first exercise over it.

After the cavalletti come the jumps. Jumps for draft horses? Ridiculous! Not at all. More than that, they are essential to maximum development and after the colt has worked on the cavalletti and over the jumps, you'll hardly recognize him as the same colt you started to develop a week or two before. Jumping, as applied to draft colts, is no more of a threat to their feet and legs than running in pasture where they jump quite naturally if they happen to want to jump an obstacle in their way rather than to go

around it or to turn back. It may be started at 6 months and continued until 18 months old, or longer, according to breed and weight.

The jumps should be placed in a rail-enclosed lane which, as in the case of the cavalletti lane, may lead to and from paddock or pasture. The object is not to develop a jumper, but to teach the horse extension, handiness, how to apply energy to his *push* while keeping himself in *balance*, and how to "set" himself for effort. I believe the jumps for draft horse development should be from two, to two and one-half feet high and they should be placed in a lane eight feet wide.

The jumps may be no more than good, heavy rails held in place on the uprights by pegs at an angle or hung in sections of automobile tire bolted to the upright. This latter is an especially good holder because it will let the bar go if hit hard, but it will not let the bar roll off at each little tick. As in the case of the cavalletti, the horse *must* be allowed to traverse the course at liberty and wearing no more than a halter. More urging may be needed to get a horse over the jump course the first time, which should be made up of four jumps set twenty feet apart, than over the cavalletti course. *Never*, however, should the horse be whipped or frightened into rushing his jumps. As soon as he learns that pasture freedom is the reward at one end, and grain or water at the other, he'll traverse the course at his chosen speed. Be sure, always, if more than one colt is being handled at a time, that they traverse these lanes singly. If turned into either lane, even in twos, playful competition will develop, the desired movements and extensions will be lost, and injuries from speed in company will be a possibility. If the cavalletti and jump lanes are properly constructed, and the colt is allowed to traverse them at liberty and at his own gait, there is no more probability of injury than from freedom in pasture.

Every draft horse that serves as a show horse for the milk companies, the brewers and others who display fine horseflesh in the draft classes, is the result of some such schooling as detailed here. Basically, they are no better than many of the heavy, ponderous plodders that bring run-of-market prices and fail before their years of top usefulness are hardly begun. But because they know what to do with their feet, how to keep themselves in balance, how to move with ease, and how to apply leather-stretching power forward or backward without strain or injury to themselves, they stop the show at the auctions. A little extra time and effort invested in more of them

would add hundreds of thousands of dollars to the incomes which breeders derive from the sale of their surplus colts; and the thought about such horses keeping the market secure and active for draft horses, is significant. The automotive market, or any other, could be killed if the manufacturers continued to turn out trucks and tractors that didn't stand up and perform to the satisfaction of the buyers. This schooling of draft horses in preparation for work isn't the complete answer, but it is an important part of it.

Mr. Bosworth is author of the book, "Breeding Your Own—How to Raise and Train Colts for Pleasure and Profit," recently published by the well known publishing house, The Derrydale Press, New York City, N. Y.—EDITOR

Chickens Balance Own Rations

EXPERIMENTS conducted by the poultry department, West Virginia Agricultural Experiment Station show that chickens eat pretty well-balanced meals when they have an opportunity to select their food. The specialists have been testing various rations to find the best methods for feeding grain to produce the most eggs and maintain the health and vigor of the hens.

When pullets had free access to whole grains and mash, so that they could eat of either as they chose, they adjusted their intake of protein by consuming more or less grain, depending on the amount of protein in the mash. In all cases when the pullets were fed concentrated mashes, they ate less mash and more grain, but the total amount of feed consumed remained fairly constant. If a less concentrated mash was offered they ate more of it and a correspondingly less amount of whole grain.

Based on these findings, the poultry experts believe that farmers who have home-grown grains could feed these grains to advantage to their laying hens supplementing them with concentrated mashes, and allowing the hens free access to both grain and mash so they can balance their own ration.

Another interesting and significant finding brought to light through these experiments is that it's entirely possible to overdo a good thing. When five per cent of alfalfa leaf meal was used in the mash the results were satisfactory, but when the amount was increased to ten per cent there was greater mortality, lower production, and more feed was required to produce a dozen of eggs.

—*Southern Planter*

Baking Soda for Shipping Fever

Condensed from Cimco Fortnightly

THE old bugaboo "shipping fever" is again making its appearance. For years, many feeders have felt that ordinary baking soda was useful in cutting losses from this disease. Now comes a report on a definite study being made by the Bureau of Animal Industry and the Kansas City Live Stock Exchange. This is important information for livestock men and a digest of the report is printed herewith.

"It appears that shipping fever in cattle results from the activity of certain disease producing bacteria in animals whose resistance has been lowered. These bacteria are found in healthy cattle everywhere, even in cattle on the open range and farm. But as long as the animal's natural resistance is normal, these organisms seem unable to produce disease. With the change of environment such as shipment to market or feed lot, exposure to cold, wet weather, exhaustion, overcrowding in cars or trucks, overheating or gorging on feed and water, the animal's resistance is lowered and favorable conditions are established for the development of shipping fever.

"There is evidence to support the contention that at the onset these environmental changes which lower the resistance of the animal also alter the chemical balance of the body in its acid-alkaline relation, subjecting the individual to the effects of the ever present secondary invading bacteria. Bicarbonate of soda, baking soda, tends to restore and maintain normal acid-alkaline equilibrium and thereby renders the animal more resistant to disease."

Baking Soda Experiment

"In March, 1934, the United States Bureau of Animal Industry joined with the Kansas City market agencies and feeder buying customers in baking soda feeding experiment.

"The object of this experiment is to determine the value of bicarbonate of soda in the prevention and treatment of shipping fever. As this experiment is still in progress, no definite conclusions can be drawn at this time. However, from records kept on 36,445 cattle in the latter seven months of 1936, it is shown that the percentage of loss from shipping fever is approximately two times as great in those not fed baking soda as in those given proper amounts.

"Even though the cattle fed soda were those having a higher

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percentage of sickness upon arrival, reports indicate that the soda treated cattle showed practically no sickness at the end of two weeks. Reports indicate that soda was fed largely to lots that appeared to be suffering from symptoms of shipping fever. Soda was not fed so much to lots that appeared healthy. Even with these odds as a handicap, the soda treated were reported as normal again at the end of the first two weeks after arrival, while some sickness was reported in the non-treated cattle. The percentage of loss on the soda treated lots was but one-half as much as in lots receiving no soda or too small amounts of soda.

"However else soda may aid in maintaining health, we know definitely that soda given at the rate of two ounces per hundred pound weight of animal acts as a mild laxative. If soda did nothing else for fresh arrivals than to stimulate elimination from both the intestines and kidneys, it would pay well to feed it.

"Reports indicate that best results are obtained in preventing colds or shipping fever when one ounce of soda for each hundred pounds weight of animal is fed each day for a period of fourteen days. This dosage should be doubled for animals showing any symptoms of colds or shipping fever. Smaller daily doses of soda appear to be less effective."

Methods of Feeding Soda

"It is advisable that feeder cattle be given the baking soda treatment immediately on arrival at the home farm. One of the easiest ways to feed it is to mix five pounds of baking soda in each barrel of tank water. If the volume of the tank is not known, keep enough soda mixed in the tank water, so that soda can just be tasted. Many farmers have a tank of soda water ready for new arrivals and give them no other kind of water for the first two weeks. Some like to feed soda by scattering it over ensilage. Others prefer to mix the required amount in the dry feed. A number of farmers report that they mix salt and soda in equal parts or put baking soda in the salt boxes and keep this mixture before the cattle throughout the feeding period. Baking soda tends to prevent and relieve bloating.

"As sick animals do not eat much, they should be given supplementary amounts of baking soda. A drench of two ounces of baking soda per hundred pound weight per day for a period of three or four days is usually sufficient. A common practice is to put three separate handfuls into a sick calf's mouth. This is a safe method of giving baking soda. More than two ounces of soda per day per hundred weight acted as a strong laxative.

"A review of buyers' reports

in our shipping fever survey indicates that the greatest losses from all shipping causes, including shipping fever, occurred in badly overcrowded loads that were shipped comparatively long distances. Overcrowding and overloading of cars or trucks are important factors in crippling, trampling, deaths, excessive shrink, fatigue and shipping fever in feeder cattle.

"Railway rates have been so modified by the introduction of the trailer car tariffs in the Western Trunk Line Territory that shippers can ship half or more than half of a car of overflow feeder cattle at the same rate per hundred as charged for a whole carload. So, there is no saving gained in freight charges by overcrowding a shipment of feeder cattle in this territory.

"Feeder cattle are live animals and should be treated as such. Too long periods of shipment without rest and water lower the animals' resistance and make them more susceptible to colds and shipping fever.

"From our correspondents' replies we do not attempt to conclude that bicarbonate of soda is a cure-all. Many livestock feeders have stated that from practical experience they have found soda to be an aid in the prevention and treatment of colds or shipping fever, an aid in the control of calf and chicken scours and an aid in the growing of hogs. But regardless of its preventive or curative value, soda like all other preparations cannot overcome in fresh feeder arrivals all the bad effects of lack of sanitation, overcrowding in shipment, gorging with feed or water, lack of adequate shelter in cold, wet weather, lack of rest and good dry bedding, lack of clean water and improper amounts of nutritious, palatable forage and feed.

Selecting Fertilizer to Fit Soil and Crop

Condensed from Eastern States Cooperator

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EACH winter the grower is confronted with the old problem: how much of which kind of fertilizer shall I use next spring? The state agricultural college extension specialists may have distributed useful tables of recommendations for the various crops. The fertilizer manufacturers probably have issued something along this line. The farm journals contain numerous statements concerning so many pounds of this or that grade for one or another of the crops. Although these may be helpful in providing something definite in the way of a "shotgun" prescription designed to give favorable results on a wide range of conditions, the final decision must be made by the man on the land. He should know the peculiarities of his soil better than anyone else. If he has studied his crops, he is aware of how his past treatment has succeeded or failed. He must adjust the demands upon his cash or credit to reasonable assurance of adequate and prompt returns. However much he might realize what he *should* do toward improving his soil to produce a favorable report when he has it tested, there is only so much he can afford to do with the resources he has at hand.

In deciding upon a fertilizer treatment, the following considerations should be called to mind:

(1) *The fertility level of the soil, with respect to the constituents of the fertilizer.* Nitrogen is less needed after legume crops and on manured land. Available phosphorus becomes more abundant in most soils after several years of liberal fertilizer treatment, especially when the soil is favorably, but not excessively, limed. Heavy manuring provides much potash. Most other northeastern soils not affected by these treatments may be classed as definitely low in their fertility levels with respect to nitrogen, phosphorus and potassium, unless reliable soil tests reveal them to be otherwise.

(2) *Differences of capabilities of crops to make reasonably good growth on soils that are comparatively poor in fertilizer constituents.* Space does not permit an exhaustive discussion along this line. Many of these conditions

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have been proven by experimentation, while others have not been fully studied by agronomists and horticulturists. Typical cases are these: well inoculated legume crops do not need fertilizer nitrogen; alfalfa does poorly unless liberally supplied with both phosphorus and potash, either from the soil or the fertilizer; grasses for hay are more limited by lack of nitrogen than by deficiencies in mineral elements; cereal crops, while responsive to moderate fertilizer treatment, require much lower fertility levels than potatoes or vegetable crops; tobacco is especially exacting in its needs for nitrogen and potash; short season vegetables require very liberal fertilizer treatments on soils capable of growing crops of field corn, hay or pasture with little or no treatment; buckwheat or rye does well without fertilizer on many soils that are unable to meet the needs of most other crops.

(3) *The relative acre value of the crop.* When the total yield of a good crop is worth only from $20 to $50 per acre, as in the case of pasture, forage and grain crops, the expenditure for fertilizer cannot be more than a few dollars per acre, even though the yield might be further improved by more costly applications. If the dairy farmer is to make a business success in the use of his land, he must maintain the fertility of his soil by effective recourse to manure, lime, legume crops and clover as a component of the pasture herbage with fertilizer purchases designed to render these more effective in providing his crop needs. It is possible to grow field corn for feeding purposes for many years without the benefit of manure or legumes without serious deterioration of crop yields and soil fertility, if a liberal complete fertilizer program is practiced. However, the cost of such treatment would be out of all proportion to the returns. On the other hand, crops that are worth hundreds of dollars per acre can readily pay handsome returns on $20 to $50 per acre spent for fertilizer. Tobacco, potatoes and many vegetable crops are typical examples.

(4) *The method of applying the fertilizer.* Lighter amounts of fertilizer applied in close proximity to the plant, as in spot or band placement, are as effective as heavier treatments applied broadcast over the entire area before planting. Machines are now designed properly to provide safe and efficient localized placement of amounts of fertilizer adequate to meet the needs of many crops, except on soils that are otherwise neglected as to soil fertility.

(5) *The concentration of the fertilizer.* The fertilizer *must* be considered from the standpoint

of the actual number of pounds of nitrogen, phosphoric acid and potash per acre to be supplied by the treatment. If the farmer wishes to use 80 pounds of nitrogen, 160 pounds of phosphoric acid and 160 pounds of potash per acre in growing a crop of potatoes, he may use either 1600 pounds of a 5-10-10 or 1000 pounds of an 8-16-16. If he is to grow a crop of wheat under conditions where a fair treatment would be 10 pounds of nitrogen, 30 pounds of phosphoric acid and 10 pounds of potash per acre, he may choose between 200 pounds of a 5-15-5 or 125 pounds of an 8-24-8. He should consider the differences in cost between amounts of the various fertilizer grades supplying the same quantities of actual plant food. Thus, if a farmer can get 20 pounds of nitrogen, 60 pounds of phosphoric acid and 20 pounds of potash for seven dollars in a medium analysis fertilizer, the same sum in the more concentrated fertilizer may buy 24 pounds of nitrogen, 72 pounds of phosphoric acid and 24 pounds of potash. If he has the seven dollars per acre to spend, it may be wiser for him to use the heavier quantity of plant food in the latter case rather than to keep the saving in his pocket.

(6) *Crop limitations due to climate, weather, plant pests and uncontrollable soil factors.* Farmer Jones is now growing 30 bushels of a given crop per acre and the best he can hope from his difficult soil, with the usual plant pest troubles and crop injury due to hot, dry weather in midsummer, is 40 bushels per acre, even with all that he can gain from any fertilizer treatment. Farmer Brown, living in another state on more favorable soil and with more equitable climate, not troubled with the insects or diseases that bother Farmer Jones, may get 40 bushels without having to use fertilizer; yet he may expect a yield of 100 bushels per acre with liberal crop feeding. Here is the answer to why potatoes in Aroostook county, Maine, commonly yielding 500 bushels per acre, can pay for 1200 pounds or more of an 8-16-16, while in Lehigh county, Pennsylvania, where no fertilizer can hope to produce such yields on a commercial scale, the use of more than 800 pounds of an 8-16-16 per acre could not be reasonably justified.

Suitable acre-increment rates of various fertilizer constituents:

Nitrogen: As a component of a mixed fertilizer, nitrogen should rarely be applied at a rate of less than about 10 pounds per acre. It is commonly recommended at about this amount in grades of the 1-3-1, 1-4-2, and 1-4-5 ratios for grain and non-legume forage crops, especially in the Middle Atlantic states. It is used for grass hay or pasture topdressings

at about 20 pounds in the 1-4-5 ratio and at from 30 to 40 pounds per acre in the 1-2-2 and 1-1-1 ratios. Sweet potatoes are favored by such amounts of nitrogen in the 1-2-3 and 1-4-5 ratios. For vegetable crops of moderate fertilizer response and acre value, 40 to 50 pounds in the 1-3-1, 1-2-1 and 1-2-2 ratios are suitable. From 60 to 100 pounds are profitable for potatoes and many vegetable crops, in the 1-2-1, 1-2-2 and 1-2-3 ratios. For exceptionally nitrogen-responsive vegetable crops of very high acre value and occasionally for potatoes on land of unusually high yield potentialities, there may be justification for as much as 120 pounds of nitrogen in the 1-1-1 or 1-2-2 ratios. However, as a rule when nitrogen is to be used at more than 100 pounds per acre, the extra amount may well be obtained from a single source material, such as calnitro or nitrate of soda, applied as a side-dressing during the growing season. Tobacco, for Connecticut Valley conditions, is a special case demanding from 160 to 200 pounds, in the 2-1-2 ratio, applied before planting.

Single source nitrogen materials used as a topdressing on grass sod or as a side-dressing for vegetable crops should supply not less than about 20 pounds and not more than about 40 pounds of nitrogen per acre.

Phosphoric acid (refers to "available" phosphoric acid as expressed in fertilizer terminology, representing 2.3 times the amount of *phosphorus* as the element): In order to prevent soil deterioration with respect to phosphorus, it is advisable to provide about 30 pounds of phosphoric acid per acre for each year when crops are removed or livestock is grazed. This represents the absolute minimum in a single fertilizer treatment and is often effective for small grains on soils of average fertility and in hill or row placement for corn on manured land, in the 1-3-1 ratio. From 40 to 50 pounds per acre are more generally desirable for most field crops, in the 1-3-1, 1-4-2 and 1-4-5 ratios. On definitely phosphorus-deficient soils, the treatment should provide a minimum of from 60 to 80 pounds per acre whenever fertilizer is to be used in the rotation, in a ratio dependent upon needs with respect to nitrogen and potash. For more intensive crop production, considerably larger amounts are provided in the 1-3-1, 1-2-1 and 1-2-2 ratios, up to about 160 pounds per acre. However, in soils that are fairly rich in phosphorus, amounts in excess of from 80 to 100 pounds cannot be considered as effective portions of the fertilizer, contributing only to building up an unnecessarily high reserve of available phosphorus. The 1-1-1 ratio

tends to guard against this waste in fertilizer use, and it is reasonable that we should also have a 1-1-2 ratio, not provided at present.

As a single source material in pasture improvement or in connection with legumes, phosphoric acid should be provided at from 60 to 100 pounds per acre, depending upon soil and crop needs.

Potash (as expressed in fertilizer terminology, representing 1.2 times the amount of *potassium* as the element): As supplied in 1-3-1 ratio grades, for small grains or corn, as little as 10 pounds per acre is frequently used. This may be an adequate supplement to a reasonably favorable condition of potash liberation in the soil, especially on land receiving at least some manure. From 20 to 40 pounds per acre as provided in light applications of 1-4-2 and 1-2-1 ratios is usually a more desirable dosage for general field crops, especially on the lighter soils. Alfalfa and most other legumes make heavy demands upon the potash of the soil; hence, this constituent may well be supplied in amounts at least equal to the phosphoric acid, as in the 0-1-1, 1-2-2 and 1-4-5 ratios, at from 60 to 120 pounds per acre. Potatoes and most vegetable crops are poor feeders upon the native potash of the soil and remove large amounts in the harvested crop. When little or no manure is used, rates of from 100 to 200 pounds per acre are favorably provided in 1-2-2 and 1-2-3 ratios. On manured land or on loamy soils of good phosphorus availability, corresponding rates of 1-3-1 and 1-2-1 ratios provide from 60 to 100 pounds for such crops. Tobacco is especially exacting in its potash needs, demanding from 160 to 200 pounds in the 1-2-3 ratios for Pennsylvania, or the 2-1-2 ratio for the Connecticut Valley.

Potash is rarely used as a single source material, except as a companion to superphosphate for pastures and legumes. It is thus supplied at from 60 to 120 pounds per acre, usually in the form of muriate of potash. It may also be used in the form of nitrate of potash or nitrate of soda-potash in side-dressings or for orchard treatment, in amounts of similar magnitude to the above.

The rate of application of the fertilizer is determined to a considerable degree upon the ratio it represents. Thus, the 1-3-1 could not conceivably be used to supply more than about 160 pounds of phosphoric acid; hence, its maximum rate in the 8-24-8 grade would be about 650 pounds per acre. The 4-16-20 grade could not be practicably used on crops needing more than about 40 pounds of nitrogen per acre. The 8-16-16 grade has been frequently used at the rate of as much as

1500 pounds per acre for potatoes in Maine. The 0-20-20 grade would rarely be justified at more than 600 pounds per acre. The 8-4-8 grade, for tobacco in the Connecticut Valley, would be required at about 2500 pounds per acre.

The fertilizer should be used in a quantity sufficient to provide the desired amount of the most needed of the three constituents, without using too little or too much of the others. If the farmer decides that 80 to 90 pounds of phosphoric acid should supply his *most limiting* need, he must also consider what other nutrients he may wish to use. He could, for example, use this quantity of phosphoric acid and vary the nitrogen and potash as illustrated by the table on this page.

Note by this example how a fertilizer table might be prepared to suggest what would be a good choice under average conditions. It is up to the farmer to make his most intelligent selection under conditions that seldom represent the extension agronomists' idea of that average.

		Lbs. of Nitrogen	Lbs. of Phosphoric Acid	Lbs. of Potash
400 pounds	20 percent Super-phosphate	none	80	none
400 pounds	0-20-20	none	80	80
500 pounds	4-16-20	20	80	100
500 pounds	8-16-8	40	80	40
500 pounds	8-16-16	40	80	80
350 pounds	8-24-8	28	84	28

What Affects Profits?

Condensed from American Poultry Journal

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IT is not possible for anyone to establish a set rule for success nor lay down a definite plan of action that will work in detail for each individual. Nor is it possible to set up a table of cost and profit figures into which each poultry farm will fit 100 per cent.

Nevertheless, an average of costs and profits of men engaged in the same type of poultry farming in the same area is of value in that it indicates what may be expected, and may well serve as a guide to those whose figures on their own operations are not so complete as they might be. Some interesting deductions may be made from such a set of figures.

For example, business analysis made from a survey of 114 poul-

Comparative Efficiency on Poultry Farms

Measures	Wholesale Farms	Retail Farms	Breeding Farms
Number of Farms	71.	34.	9.
Size of Business			
Number of Men	1.8	1.8	4.1
Number of Laying Birds	1,207.	942.	1,860.
Dozens of Market Eggs Sold	15,835.	13,636.	17,674.
Capital Invested (include dwelling)	$11,631.	$9,791.	$23,788.
Labor Efficiency			
Number of Birds per Man	681.	519.	456.
Labor Cost per Bird	$1.35	$1.81	$2.32
Cash Receipts per Man	$4,883.	$4,226.	$4,954.
Efficiency in Investment			
Capital Invested per Bird	$9.64	$10.39	$12.80
Percent Sales are of Investment	74.	78.	85.
Eggs Produced per Bird	174.	161.	195.
Average Egg Price per Dozen (cents)	30.6	37.0	23.6
Poultry Sales per Bird	$6.97	$7.90	$10.50
Cash Return per Farm	$1,235.	$972.	$2,835.
Cash Return per Bird	$1.02	$1.03	$1.52
Farm Income per Farm	$1,625.	$1,104.	$3,322.
Farm Income per Bird	$1.35	$1.17	$1.79
Labor Income per Farm	$1,130.	$681.	$2,336.
Labor Income per Bird	$0.94	$0.72	$1.26

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try farms in Massachusetts in 1937 indicates that a breeding business—selling hatching eggs and baby chicks—is the most profitable. To the surprise of many, the labor incomes from the wholesale farms averaged higher than from the retail farms. Particular attention was given to the study of egg production, size of business, labor efficiency, and the efficiency in the use of capital invested in the business. The farms were classified into groups of 71 wholesale, 34 retail, and 9 breeding farms.

The more important reasons for low incomes on some of the farms were:

1. The unfavorable feed-egg ratio of 1937.
2. Inefficient use of labor.
3. Low egg production.
4. Lack of diversity on some farms.
5. Small size of business indicated by small flocks.
6. Buildings and equipment not used to capacity throughout the year.

Lack of diversity is likely to show up to a disadvantage when the price relationships are unfavorable. When prices are favorable, a specialized business will make more money.

In the accompanying table, *poultry sales* refer to the total receipts for eggs, fowls, broilers, pullets, and chicks divided by the average number of birds. *Cash return* is the difference between total cash receipts and total cash expenses. *Farm income* is the cash return adjusted for changes in inventory and value of family labor. *Labor income* is determined by subtracting 5% interest on mortgage-free investment from the farm income.

Farms were classified as breeding farms if 50% or more of the income came from the sale of chicks, hatching eggs, or breeding birds. Similarly farms were classified as retail farms if 50% of the increase came from the sale of eggs and poultry at retail. Farms not falling in these classifications were listed as wholesale.

The breeding farms were largest, and had the highest egg production and the highest labor income. The number of birds per man was low because of the time spent on the baby chick business, but sales per man were highest. Investment per bird was highest, chiefly because of a higher value per bird and the extra equipment needed for this type of business. Egg prices were lowest because only small eggs were sold on the market, while the first quality eggs were incubated or sold as hatching eggs.

It was somewhat of a surprise to find that the retail farms had the lowest labor income. There are several reasons why this seemed to be true: (1) size of flocks was smallest and egg pro-

duction was lowest; (2) the labor efficiency was low, as shown by the number of birds per man and the labor cost per bird; (3) the time spent in delivering eggs on retail routes or other outlets was charged to the farm business, and this probably resulted in less supervision and management of feeding and care of the flock. This probably was the reason for the lower production.

The retail farms had a higher investment per bird, which meant higher taxes and interest charges. The unfavorable feed-egg ratio of 1937 worked to the disadvantage of the retailer because in this class a greater percentage of the income must come from market eggs. The retail farmer was more affected in 1937 than the wholesaler or breeding farm which had a more diversified business.

The analysis of the business of farms located in areas surrounded by large cities where retailing can be carried on most advantageously showed higher incomes than the average of the retail farms. Retailing is looked upon with favor if properly conducted, and this study should point out the need for carefully watching all details rather than to condemn the method.

The wholesale farms average higher than the retail farms in all favorable factors except in "Percent Sales of Investment." Larger size, more efficiency, higher egg production, and lower investment per bird were important factors in causing these farms to show a higher labor income than the retail farms.

On the breeding farms, the egg production per bird, size of flock, and the total capital investment were much greater than for the other types of farms. The number of birds cared for per man was lower, as much of the time was spent on the hatching egg and baby chick business.

The labor income ranged up to $6,022 on the breeding farms. The most profitable farms were larger than the others in capital investment, number of birds, chick sales, egg sales, and total receipts. Egg production was high, and labor efficiency was good.

The average investment in all farms in Massachusetts was $12,042. This was $7.76 on each bird housed and $10.21 on the average number of birds kept; 17% of the investment was in the laying flock, 10% in machinery and equipment, and 70% in land and buildings. The dwelling was included in the 70% and represented 31.3% of the total investment. The average investment in the home was about $3,800. Had the dwelling not been included in the capital invested, the labor incomes would have been about $190 greater.

There was much diversification

on all types of the farms. On 37 of the wholesale farms, some eggs were sold at retail. Baby chicks were sold on 36 wholesale farms and on 10 retail farms; 10 of the retail farms and 17 wholesale farms reported crop sales and had a higher income than the average. Diversification seems to be rather important in the poultry industry in Massachusetts.

Each man's problems are his own, and while the method of management may vary on individual farms within these various groupings above or below the averages given, the profit figures are significant as to what might be expected in this section under conditions similar to those at the time the survey was made.

Silk Worms in the South

Condensed from Southern Agriculturist

Charles Seymour Conkling

YOU would have been forced by law to plant mulberry trees if you had been a Virginia landowner some 300 years ago! The House of Burgess, the ruling body of the time, required one tree for every ten acres owned. And the farms of that day ran to 10-, 20- and 30-thousand acre holdings. This meant digging from 100 to 300 holes in which to plant young mulberry trees. And there were no post hole diggers in those days. But why all that interest in mulberry trees? Because, someone got the idea that American-grown silk could be sold cheaper than the imported product; that the heavy duties on silk brought in from France and Southern Europe could be eliminated.

If it hadn't been for a shipwreck the industry would probably have been started as early as 1609, for in that year King James I sent a ship across the seas laden with silk worm eggs. The cargo never reached America. Some 14 years later the silk worm was actually introduced, and the Virginians were urged to take up the new industry. It was at this time that the law was passed making the planting of mulberry trees, the food of the silk-worm, compulsory.

Silk was actually produced! Charles II stepped into court one day completely attired in a costume made of the American product. The material cost its weight in gold, it is said. A few members of the British royal family also are reported to have worn garments made of American silk.

Virginia was not the only state to take up the silk industry. Georgia, Pennsylvania, Delaware and the Carolinas also offered bounties for production. The Huguenots were sent to the Carolinas for the very purpose of raising silk, for they were skilled workmen—they knew the business.

The good ship Richmond, loaded with Huguenots and silkworm eggs started across the ocean in 1680, commissioned by the British government. It was bad sailing and the ship was delayed but the silk-worms did not delay their hatching. Out came the tiny worms! For lack of proper food the entire hatching soon died and the development of the industry in Carolina was thus set back. However, a few years later another shipment of eggs was sent

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across the water and the industry began.

Gradually things got into shape. Mulberry trees grew native in the land and they were also easily cultivated. The climate seemed favorable and the special bounties offered by the English government proved an incentive to try out the new business. It was only a short time until baled silk from America was pronounced excellent, and a rosy future looked inevitable.

Within a few years the private experimental stage of the silk industry was passed and the government proposed to make it a public enterprise. A commission was appointed and startling were the findings. It was learned that two crops of worms could be expected in a five-month season. After considerable estimating and figuring it was also determined, on paper, that one manager and six negroes could make 65 pounds sterling a season. Profits were to go to the public treasury. The station was put into actual operation and a training school for apprentices was started. These apprentices were supported by public money while being taught the silk art.

About this time a colony was formed in South Carolina for the express purpose of raising silk. It was known for more than a century as Silk Hope. Although this colony literally crawled with worms for a time, hope of ever making anything of the industry died long before the century was over. Labor costs were too high. As a leading industry, silk was doomed.

Interest in silk gradually waned until 1838, when Samuel Whitmarsh, of Pennsylvania, introduced the South Sea Island mulberry, which was supposed to be far superior to any other species. The country became madly enthusiastic. Plants and crops were pulled out ruthlessly to make room for this new tree, which proved good speculation. Many a lucky man made a fortune on rapidly advancing prices of the trees alone. Over $300,000 changed hands for plants in one week. But the big boom was short-lived. Soon the farmers went back to planting grain.

The last silk worm fever hit California in the 1860's. A law was passed offering reward for silk production in 1866, just 200 years after the silk laws of Virginia had been withdrawn. The California law was short-lived and another law introduced in 1872 for state aid for silk growing was defeated. However, there was considerable interest in the industry in California as late at 1890.

Eventually the silk-worm industry died, but it died hard. On rare occasions one hears of someone who is raising silk worms as a hobby today.

Producing Clean Milk

Condensed from Guernsey Breeders' Journal

Wm. H. Juzi

EVERY farmer producing milk is concerned with the possible danger of high bacteria counts which may deprive him of a premium for this milk, or at times possibly a market.

There are two causes for a high bacteria count. First, the relatively small number of bacteria which are found normally in freshly drawn milk are allowed to multiply; second, a large number of bacteria present at the start, although kept from multiplying, are not killed.

Bacteria of the type with which we are concerned in milk will multiply under the following conditions:

I. They must have food, milk supplying an abundance of it.

II. They must have moisture, which of course is present in milk.

III. They must have a temperature at which they can multiply, fifty to one hundred degrees Fahrenheit.

IV. A small amount of air is also necessary and a sufficient amount, too, is already present in the milk.

It, therefore, is very evident that if anyone of the above conditions can be controlled so as to be unfavorable to the propagation (multiplying) of bacteria, we do not need to be concerned with the possibility of high bacteria counts, if the number which originally gets into the milk is kept at a minimum.

The best and almost only method to prevent propagation of bacteria in raw milk is to bring the temperature of the milk to below fifty degrees as soon as possible after it is drawn from the cow. This low temperature must be maintained until the milk is pasteurized or bottled and placed into a refrigerator. The most severe problem then remains, to have an original low bacteria count in the milk.

Bacteria are present in the air, in feed, on hand and clothes, on the milk stool, on the hairs of the cows and in any moist place in or about the barn and dairy house. Methods of producing milk of low bacteria count are outlined below:

1. Let us begin by putting the cows into the barn. Once the cows are in the stable, you squeeze yourself along the side of the cows and the post to fasten the animal. Some dirt will come off

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October 15, 1939

on your hands and clothes. It is evident that you should not wear these same clothes during the milking process.

2. To prevent the dirt from falling into the milk pail, it is best to have as little hair as possible in the immediate vicinity of the milk pail. That means clip all hair from the udder and flanks, making a line from the hip bone to the center of the belly, preferably on both sides, for the tail can switch the hair and dirt from left to right. Clip the tail with the exception of the switch at the end and keep that clean. It is not desirable to clip hair off the flanks in the summer. Fly-spray often may cause blistering if no hair protects the skin. Brushing the flanks thoroughly will be sufficient during the hot months.

3. Before you change your clothes for the milking suit, brush the animals and sweep down the walk between the aisles properly. Thus you won't track dirt into the milk house.

4. Make up a chlorine disinfectant solution which has at least a strength of 200 parts per million. (Your dairy supply man can show you how, and directions usually come with the stock solution.) Rinse all cans, milk pails, cooler, etc., with this solution which is strong enough to kill all bacteria which come in contact with the solution. Do this even if you have already sterilized the equipment after you washed it following the last milking. After you have sterilized the pails, etc., set up the equipment in a clean place to drain for about five to fifteen minutes before it is to be used. Next, use this chlorine solution to wash the cows' udder and flanks.

However, a chlorine solution loses its strength immediately when any dirt (organic material) gets into it. You might as well use plain water or dirty water if you wash the cow's udder and then let the dirty wash cloth get into the chlorine solution. You will, therefore, need at least a good-sized wash cloth for each cow you are milking. Wash the cow immediately before you milk her, then wring out the wash cloth and dry off the udder and flanks. Place the used wash cloth in an extra empty pail. Wash your hands each time you empty your pail, for, unless you are an exception, you place your right or left hand underneath the bottom of the bucket to tilt it to pour the milk. You will get bacteria on your hands doing this, but if you wash the cow before you sit down to milk her, your hands will be clean.

5. For point number five we must consider the milk stool. The last thing you do before you begin the process of milking is to touch the stool with one or the other hand. If the stool is not

clean, your hands will not be clean, so wash the stool after each milking. It should be made out of metal and sterilized the same as any other equipment which comes in contact with milk.

6 It is a known fact that bacteria are in the milk even while the milk is in the cow's udder. However, it has been proved that practically all of these bacteria in a healthy cow are located in the teat canal. Milk each teat two or three strokes into a strip cup which will give you an opportunity to observe the condition of the milk for possible mastitis and also will discard the few drops of milk which are high in bacteria.

7. If you keep the stable floor clean and only have good clean bedding, and no chaff and dirt under the cows' feet, your stable air will be clean enough to eliminate it as a danger of the bacteria source. For the same reason, it is best not to feed the cows hay or silage in the barn until after the milking. This precaution is also essential to prevent off-flavor in the milk.

8. However, stable air is never entirely free from dust and, therefore, bacteria. If milk is poured from the pail into the can in the barn, we lay ourselves open for more unwelcome bacteria. Flies also carry them in millions. To be safe—strain the milk in the milk house or some other clean place which is away from the stables and which is kept free from flies.

If you follow these instructions and cool your milk immediately to below fifty degrees after each cow is milked, production of clean milk with low bacteria count is possible.

Official Versus Ordinary Milk Production Records

From the Book Dairy Cattle and Milk Production

Clarence H. Eckles, B.S.A., D.Sc.

IN recent years official testing of pure-bred dairy cows has become general and the records of milk and fat production are given wide publicity. Such records are used as the basis of breeding. Fifty years ago a production of 14 pounds of butter in a week, or 500 pounds a year, was sufficient to justify a widespread reputation for a dairy cow. Now records over 1000 pounds in a year are too common to attract more than local interest. An important question arises in this connection as to what extent these greatly increased records of recent years are the result of better breeding and to what extent they are to be attributed to more skill in feeding and management.

Important questions also arise in connection with the records from the cow-test associations and their relation to records from official test conditions. Cow-test associations are becoming an important factor in the improvement of dairy cattle. The records of these associations, however, are decidedly below those made under conditions of advanced register testing. The question arises as to how far it is fair to compare them, and if the wide range in records between the two is due to the quality of the animals or to a difference in feed and management.

There is no question but that greatly increased milk and butterfat records in recent years are to be attributed in no small part to the results of intelligent breeding; the greater factor, however, is more skill in feeding and management. The cow under test for advanced registration is first of all prepared for the test by liberal feeding preceding the time of calving. While the test is under way she is milked three or four times daily, breeding is generally delayed, the best possible ration is provided, and she receives the most careful attention that a skilled herdsman can give. Under typical farming conditions, the milking is done twice daily, and the cow is expected to drop another calf within twelve months. The feed and care varies widely, but the cow, at best, receives far less attention than would be the case under official test conditions.

The results of a study made

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Table 60

Comparison of Results from Cows under Official Test Conditions and Ordinary Conditions

Breed	Number Animals	Official Test Conditions		Ordinary Conditions	
		Milk Lbs.	Fat Lbs.	Milk Lbs.	Fat Lbs.
Jerseys	17	10,213	531	6,554	331
Holsteins	18	18,928	618	10,456	366
Guernseys	3	12,197	552	6,983	328
Ayrshires	3	12,222	449	7,871	283
Average	41	14,331	564	8,395	343

concerning the relation between milk production under official test conditions and ordinary conditions are give in Table 60. The data used are from the records of the Minnesota, Nebraska, Storrs, and Missouri experiment stations. Records were available for 41 cows that had been kept one year under typical conditions of official testing and another year in the same herd under good practical conditions, such as are usually followed on the best farms and which are typical of cows tested in cow-test associations. These cows were milked twice a day and calved again by the end of twelve months. Table 60 shows that the cows under official test conditions average 70.7 per cent more milk and 64.9 per cent more fat than when milked twice a day and calving again within the year. The production under ordinary conditions, it should be noted, was excellent, indicating that cows that make good records under official test conditions are unquestionably superior animals and may be relied upon to give a liberal production under ordinary conditions. Taking these figures as representative, it is safe to expect the production of a cow under ordinary conditions to be about 58 per cent of her official test. These results suggest that at times there may be a tendency to over-rate cows with official records in comparison with cows tested under cow-test association conditions.

An analysis of the records reported in Table 60 shows that the difference between records made under official test conditions and ordinary conditions is greatest with those making the highest records under official test. The 41 animals were divided into two groups, those producing more than 600 pounds of fat and those producing less. The comparison is as follows:

	Number of Animals	On Official Test Average Fat Production	Under Ordinary Conditions Average Fat Production
		Lbs.	Lbs.
Above 600 lbs. fat in official test	17	673	363
Below 600 lbs. fat in official test	24	487	328

The percentage of increase in milk for the first group was 90.5 and for the second 52.9. These results are as should be anticipated. The situation is that the higher record cows have the greater capacity for milk production, and under conditions of official testing have opportunity to make use of all their capacity. Under ordinary conditions other factors set the limits and a cow that has the ability to produce 700 pounds of fat under the favorable conditions of official testing may not under ordinary conditions produce much more than one that is capable of making an official record of only 500 pounds of fat. The large records made under official test conditions are the result of a cow with outstanding ability as a milk producer combined with the most favorable environment.

The above is an excerpt from Dairy Cattle and Milk Production by Clarence H. Eckles, B.S.A., D.Sc., late Chief, Division of Dairy Husbandry, University of Minnesota and formerly Professor of Dairy Husbandry, University of Missouri, which we recommend as an excellent book on Dairy Management. It is published by The Macmillan Company and for the convenience of our readers it may be purchased through the Farmers Digest. ($3.60)

Breeding for the Future

Condensed from The Poultry Item

H. Lyle Mosher

THE responsibility for the future of the entire Poultry Industry rests mainly on the Poultry Breeders of the country.

The Breeder owes a double duty. On the one hand he owes the producer a better and more efficient egg and meat producing machine; on the other hand he owes the ultimate consumer a better and higher quality product at a lower cost.

It is upon his ability to meet these responsibilities that the increased use and popularity of poultry products and the future of a Great Industry lies.

With these thoughts in mind, we should examine the various breeding methods being employed and try to determine which are the most sound. It would be wise also to visualize the present trends in breeding work, in order to foresee the breeding plans that will be followed.

During the past 20 years we have passed through a period of exploiting the high record individual. High individual records were the goal and talking point of many strains.

As poultry keeping has expanded and entered the ranks of big business, business poultrymen have come to lose interest in the phenomenal individual whose family, counting all of her sisters raised, may not have made such a good business record after all. The business poultryman is interested in financial returns. In order to get good financial returns he must have high flock averages in all of the many factors affecting his profits.

We all know that flock averages are the result of the averages of the many families that make up the flock. If the flock consists of a group of average families, we can expect only average results. If the flock consists of a group of superior families we are sure to have superior results. It is for this reason that attention has swung to family averages in breeding work.

The family method of breeding was first used by Gregor Mendel, who appears to be the first individual to measure the breeding qualities of individual parents by the kind and proportion of offspring produced. He took into consideration in his measurement all of the offspring; whether good, bad or indifferent. This con-

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sideration of the total offspring sets Mendel's method apart from Progeny Tests.

Progeny Tests are nothing new. They were known and used over 2,000 years ago. Varro said: "The quality of a ram can usually be determined by his conformation and from his get." And again—"you may judge them by their get, if their lambs are of good quality."

Many breeders today are using the Progeny Test in poultry breeding and following these same rules laid down by Varro, 2,000 years ago. But why not always select a breeder by its get, whether its offspring is of good or poor quality? Why measure only the best offspring?

Mendel's results have shown that this is not a correct method. If Mendel had considered only the best or a few of his peas, perhaps even now we would not have a sound understanding of inheritance.

Mendel did a simple but revolutionary thing that apparently had not occurred to other workers who had tried to solve the secrets of inheritance. He carefully sorted the offspring of his parent plants according to their different characteristics and counted the number that displayed each character. By doing this he discovered that when the characteristics which he was studying were handed on by the parents that they appeared among the progeny (offspring) in definite mathematical ratios; and that these ratios remained constant. Mendel demonstrated for the first time that heredity followed definite laws of inheritance.

However Genetic Breeding or breeding according to the science which Mendel's discovery founded is an expensive and in some phases a technical process. The compiling of the true average of "all" of the offspring from a pair of parents is naturally more expensive because it means the holding and measuring of inferior individuals as well as superior ones. Yet it is in this measuring of the inferior individuals that much of the future success of the commercial poultry industry lies.

It is the inferior individual that lowers the profits of the whole flock. They are definitely a factor governing the return from the poultry enterprise. The producer must contend with the inheritance of every individual which he raises.

In order to develop the most profitable strains of poultry a large number of factors must be incorporated in the breeding flock. Not only must these factors be present here; but also breeding birds must possess the ability to pass on these traits with relative accuracy to future generations. Any one of these factors

is controlled by several different genes.

To bring present strains to highest efficiency we must improve the following points, each one of which has a definite bearing on the profit-making qualities of the stock.

Of first importance comes biological soundness. This means birds with sound, normal and healthy organs and bodies. This biological soundness affects the expression of most all of the profit making factors. Under this heading also might be listed high fertility, high hatchability, high chick viability (ability to live) and high adult viability.

We all know that we must have birds that produce at a high rate. High average flock production is one of the most important profit factors in a commercial egg strain. Future strains must not only exhibit this characteristic in their first year of lay, but they must possess the inbred quality to go on producing at a profitable rate for a period of two to three years or even more. In other words birds of the future must have a long production life.

In addition to a heavy production, the eggs which they produce must be of the highest quality if we wish the consumption of eggs to increase. Under high external and internal egg quality the breeder must consider such factors as good shell texture, correct color of shell, a high percentage of thick albumen or firm white; and possibly even the color of some of the inner membranes, in order to improve candling quality.

Another point that the breeder must consider is high disease resistance and ability to thrive under commercial conditions of ordinary sanitation in large groups and under simplified management. To reach this goal birds must be bred and selected under these conditions.

Breeding work of the future will be able, by applying the laws of inheritance and securing a measurement of whole families, to eliminate the many defects which from time to time appear in different strains; such as: crooked toes, runts, slow feathering, twisted backs, grey eyes, off color plumage, malposition of the embryo in hatching chicks, etc., each one of which helps to narrow the margin of profit in commercial production.

Another great field for the breeder of the future will be breeding of strains to utilize feed at the highest efficiency. It has already been shown that certain families grow and produce better than others on certain diets; and that their vitamin and nutrient requirement varies.

The cockerels from future production strains will possess better meat qualities than those of the

average flock of today; and layers will end their productive life with the highest possible return in value, from a meat standpoint.

When we review the above points, is it any wonder that the job of the foundation breeder is a big one? Can there be any doubt that it is a complex and specialized one? A specialized foundation breeder needs a sound knowledge of genetics, of biology, of physiology and of poultry management. He should have a wide knowledge of general poultry conditions and of all breeding work that has been done in the past and is being done at present in other fields.

As a good business poultryman you should see that you get the results of this kind of work as directly as possible. Are the birds you buy backed directly by the work of a Foundation Breeder?

Naturally foundation breeders are not going to supply all of the egg producing machines of the future. Breeder hatcheries will undertake the reproduction and multiplication of their strains for the benefit of those who are unable to purchase direct. These breeder hatcheries can well reproduce these strains by following a set of fixed strandards.

However for the future benefit of the Poultry Industry the work of the Foundation Breeder, as complex and specialized as it is, should not be hampered by arbitrary standards.

Control of Stored Grain Insects

Condensed from The Southern Planter

S. B. Fenne

Extension Plant Pathologist and Entomologist, V. P. I.

OUR most serious pests of wheat, corn, peas and beans can fly and do not confine their attacks to the harvested grain in granaries and storage houses. Every farmer knows that the last part of the previous year's crop is always likely to be the portion most badly damaged by insects. What he does not realize is that certain weevils and moths live over the winter in his bins and fly to nearby fields and deposit their eggs upon the ripening grain, etc. These pest infestations take place when the grain is passing the "milk" stage and usually involve only a small percentage of the kernels.

The most common method employed for killing insects in bulk storage is fumigation. Insect damage to grain is not particularly noticed until the insect developing within the kernel matures and eats its way out. When the grower finds insects already attacking his grain at harvesting time, it is money in his pocket to harvest promptly and fumigate early. If the insect developing within the kernel is killed before it becomes mature, serious losses will be avoided.

There are several satisfactory methods of control. Fumigation with carbon disulphide is one of the simplest remedies for controlling weevils. This material can be purchased at most drug stores and dealers in chemical supplies at prices ranging from 8 to 25 cents per pound. It is a liquid which, upon exposure to the air, vaporizes into a gas that is heavier than air and has such a disagreeable odor that its presence always attracts attention. It is highly inflammable and must, therefore, be used with a great deal of caution to prevent fire and explosion. Seeds to be fumigated must be placed in an airtight container, such as a barrel, fumigation box, or tight bin. It is very important that the sides and bottoms of the containers be as nearly air tight as possible; otherwise the gas will be wasted.

Carbon disulphide should be used at the rate of 1 pound to each 100 cubic feet of space to be fumigated. The liquid should be poured on to burlap sacks placed on the top of the grain and im-

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mediately covered with heavy paper or tarpaulin. Small quantities of seed may be easily fumigated by placing them in watertight barrels. These should be filled within a few inches of the top and fumigated by pouring one-half cup of carbon disulphide on the seed and then covering the top of the barrel with two thicknesses of heavy wrapping paper tied tightly around the barrel.

Fumigation with carbon disulphide gives best results when done at a temperature of about 75 degrees Fahrenheit; it is not effective at temperatures below 60 degrees. The fumigation process should be continued for about 36 hours, after which the seed should be aired and then stored in tight containers or tight woven sacks. This is to prevent reinfestation.

After fumigation, the seed should be examined carefully and given a second fumigation should live weevils be found.

Caution: Carbon disulphide gas is highly explosive and extreme care should be exercised in its use. Keep all fire away from bins during the process of fumigation.

Small amounts of seed may be treated by placing them in an oven and heating to 120 to 145 degrees Fahrenheit for several hours.

Cold storage has been used very effectively in arresting the development of weevils in grain. Weevils do not feed and develop at low temperatures. The seed should be kept in cold storage, below 50 degrees Fahrenheit.

The three methods discussed above will not injure grain for eating purposes. Overheating may injure germination of the seeds for planting purposes. Some farmers have found it very effective to mix air-slacked lime at the rate of one part by weight of lime to two parts of seed. The dust seems to hold the weevils in check and to prevent the fertilization and laying of eggs. This treatment would not be desirable if the grain is to be used as food, since the lime would work into the holes and be difficult to remove.

Treatment does not prevent reinfestation. If seeds are not properly covered to prevent reinfestation in storage, these remedial measures will only be temporary. Seeds once treated should be stored in rooms free of adult weevils or placed in tight barrels or sacks to guard against subsequent infestation.

Recovering Ranges

Condensed from Capper's Farmer

M. N. Beeler

SEARCH for a hardy grass with which to resod Plains ranges has disclosed nothing to date that is better that the native cover. And investigations reveal that not one variety but a combination is best—just such a natural mixture as will be found in unabused, undepleted original stands. It is right because thru the centuries it has survived.

Plainsmen have recognized the value of such grasses, but no practical method of propagating them on cultivated land was at hand. Hence the search of explorers for foreign plants which produced seed that could be harvested and sowed with available equipment.

A practical, though laborious method of reëstablishing buffalo grass by planting sods was worked out by the Fort Hays Branch of the Kansas Experiment Station.

The "hay method," used for years by Southern farmers in establishing stands of valuable clovers, seed of which was not available commercially, recently has been employed in prairie land revegetation.

Rarely are the western grasses found in even approximately pure stands. That is true of the famous buffalo ranges. Here the cover is nicely balanced between two adapted grasses, buffalo and grama. The grama is more drouth resistant than buffalo and so during a series of dry years it predominates. Buffalo prevails when precipitation is normal.

The same situation has developed with respect to other varieties whether they be buffalo, Blue or any one of the other gramas, blue stems of one kind or another, wheat grasses, dropseed or what not. So when investigators recognized the demonstration which nature had set before them, they concluded that mixtures were more desirable than any single grass. The hay method is therefore ideally adapted to stimulating the natural combination.

The Fort Hays Station has announced an improved technique for reëstablishing native sods by this method. Inasmuch as the buffalo and Blue grama combination has obtained over a wide territory and is the best one in

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the vicinity of the station, those are the two grasses which are involved. The method and improved application, however, will serve for any natural mixture of whatever combination.

Specific directions offered by L. C. Aicher, superintendent of the Fort Hays Station, follow:

1—Select an area of natural sod in native pasture and fence it to prevent or control grazing, so that the grass will grow and mature seed. The best sod will usually produce the best yield and if a choice is offered the selection should be where desirable grasses predominate. But if there are other varieties they are not likely to be objectionable. An acre will yield enough hay for planting approximately 3 acres. Some farmers mow roadsides or other protected places.

2—Watch maturity of the seed closely. In case of buffalo and Blue grama, Mr. Aicher suggests that the grama be used as a guide. It should be taken before it is ripe enough to shatter. At such time the buffalo seed will be right for harvest. For these two the date will be around September 15 in the vicinity of Hays.

3—Harvest with header if the grasses are tall. A mowing machine with pan attached to the cutterbar is best for Blue grama and buffalo because buffalo seeds are borne close to the ground and will be missed by a header, which will gather mostly Blue grama. The pan used at Fort Hays is similar to a hopperdozer with baffle back and sides, to prevent material from dragging off, and a solid bottom. Such a pan will catch 50 per çent of the buffalo seed yield.

4—As soon as the hay thus harvested is dry enough to keep, stack it in a convenient place. Mr. Aicher asserts the grama and buffalo will be dry enough to stack directly from the pan.

5—During the summer while seed is maturing, summer fallow the land that is to be seeded. This is best done as for wheat, by listing or plowing ahead of the spring rainy season in May and June and early enough to kill the first crop of weeds. Preferably this working should be done on contour and a lister is better than a plow. The best implement in most cases will be a damming lister. Otherwise use a basin tilling implement immediately after plowing or behind the plow. Subsequent working may be done with duck-foot, rod weeder, basin lister, or blade. Implements or working which will fine the soil and leave it exposed to blowing should be avoided. It will be desirable to relist or redam before freezing weather and thus to leave the field rough over winter.

6—In spring level, firm and otherwise prepare for seeding in March, April or early May. If a

good job of fallowing was done in the year before weeds should not be a factor. The main consideration is to get the land seeded in time to take advantage of spring rains, altho in trying to determine the best time for seeding, the station established successful stands during 6 of the 7 growing months. Seeding in September is a good risk if land is ready and material available.

7—Distribute the buffalograma hay with a manure spreader at the rate of 300 pounds an acre. This is a lower rate than the spreader can be set for and so the station provides an extra man to hold the hay back. In other sections varying quantities of other grass material, depending upon varieties involved, will give a stand. Contour lines should be followed in seeding.

8—Follow the spreader immediately with a Campbell type packer, operated also on contour. This machine consists of a series of wheels with wedge-shaped rims, and is superior, Mr. Aicher asserts, to the disk drill recommended by conservationists because it does not cut the straw. The rims push the hay and seed into the ground and thereby afford coverage for the seed. Straw protrudes to resist blowing, flow of water and too rapid evaporation. In this last protection, it may account for survival of the grama, especially while it is in the seedling stage. On lighter soils of the Southwest, some such cover is necessary to prevent seedlings from blowing out or to keep the soil from drying below seedling roots. One of the best preparations for grama in the Southwestern Plains is to grow Sudan grass and allow it to cure on the ground. Then grama is seeded in the dead cover the following spring.

9—Allow the seeding to grow the first season. Limited pasturing likely can be practiced the second.

This procedure has resulted in establishing a good sod of the two variety mixture on the station farm within two years after seeding.

Necessity Started Dakota Molasses Feeding

Condensed from The Dakota Farmer

Warren E. Morrell
Dakota Farmer Staff Writer

ALTHOUGH feeding molasses to livestock is a comparatively new practice in Dakota, European farmers have been feeding the sweet fluid to their animals for more than a century. The first recorded European ration was used in 1830 and consisted of chopped straw and 220 pounds of molasses per day for 2,000 sheep, 80 head cattle and 20 horses. By 1860, the use of molasses became general in Germany, France and Russia and by 1870 its use had spread to England. About one-third of the molasses now produced in Europe is used as forage for stock. American farmers did not commence feeding molasses until about 1900.

Necessity brought molasses into Dakota and other mid-western regions when severe drouth minimized feed crops. Dakota farmers mixed molasses with Russian thistles, straw and low-grade roughage and found that livestock found such mixtures palatable and nourishing. Many Dakota farmers now are staunch advocators of molasses for fattening stock, especially swine.

Available for stock feeding purposes is molasses of three kinds—cane molasses, beet molasses and corn molasses—obtained as by-products from the manufacture of cane, beet and corn sugar. The corn product, because of its high cost and appetizing qualities for human consumption, has been little used as feed for livestock. Cane molasses or "blackstrap" is a thick, dark-colored molasses, with a sweet taste and pleasant odor. The beet product has the same general appearance, but a disagreeable odor and somewhat bitter, lingering taste. The human taste, however, is not a reliable guide as to the domestic animals' palatability requirements.

Chemists analyse cane molasses as containing: 48% sugars, 12.19% carbohydrates other than sugar, 4.81% crude protein, 12.44% mineral matter and 22.56% water. Beet molasses has the same general chemical composition, although it contains a larger percentage of mineral matter.

After knowing its chemical composition, one realizes molas-

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ses owes its feeding value to its large percentage of sugar, which is highly and easily digestible. Some investigators maintain that molasses, in addition to making feeds taste better to livestock, also makes the feeds more digestible. It is generally assumed that cane molasses has a higher feeding value than beet molasses, but there has been little work done in directly comparing the two materials.

Methods of Feeding

Some farmers feed the molasses straight, in tight troughs or pans. A self-feeder can be made by removing the plug in one end of a drum and standing the drum on end, with the open end down, in a shallow trough or tank. Many Dakotans pour or spray the molasses on feed in mangers. When fed this way, the molasses is usually diluted with about one gallon of water to two gallons of molasses.

Mixing the molasses with grains and chopped or ground forage is the most common method of feeding. It makes the feed more palatable and also reduces the dustiness. It requires more labor and equipment, however, than either of the other two methods of feeding.

Common practice is to use molasses-mixed feed within a few days after mixing. Bulk storage is not recommended because of the tendency to cake. Mixed feed has been stored for several months in sacks, but there has been some trouble with caking even by this method if the mixture was not uniform. If storage is attempted, the feed should be dry and not contain more than 20% molasses. If the hay or grain is damp, or if water has been added to the molasses, the mixed feed should not be stored for more than a few days—even in sacks—as it may mold or heat during warm weather.

Molasses companies advise farmers to feed molasses moderately for a few days, then gradually increase it. Brood animals and the very young should receive limited quantities.

When the amount of feed to be mixed does not justify an investment in equipment, a rough mix may be obtained on a floor with shovels. The dry feed is first mixed and then molasses, diluted with hot water, is added and the feed mixed again. Some farmers dilute the fluid with hot water and add it directly to the roughage, using a sprayer or a sprinkling can. Undiluted molasses may be spread over the feed with a stick.

The most common type of continuous mixer consists of a large trough in which revolve one or two shafts carrying teeth, arms or auger flights. The dry feed and molasses are poured into one end and are mixed as they pass along

the trough and flow out the other end.

Some farmers have made improvised continuous mixers by mounting a 10-inch auger in a trough 12 inches wide by 12 feet long. The bottom of the trough is sheet metal bent to a semi-circle, giving a half-round bottom. The auger turns from 100 to 200 revolutions per minute. For speeds much above 100 r. p. m., the trough should be covered to prevent the feed from being thrown out. Open-flight augers mix better than continuous or regular augers.

Hammer mills with the screens removed can be used for mixing. The molasses is added to the hay through a pipe drilled with ⅛-inch to ¼-inch holes about one inch apart and placed horizontally across the throat of the feeder so that the small streams of molasses pour onto the hay just before going into the hammers. The molasses pipe should be equipped with a quick-closing gate and should be so arranged that it can be swung quickly away from the feeder to prevent molasses from going into the mill while running empty.

Mixing can also be accomplished by running the molasses into the blower of a grinder or chopper.

With the continuous-type mixers, it is difficult to obtain constant proportions of molasses and roughage or grain. When constant proportions are desired, a batch-type mixer should be used. In these mixers, measured amounts of the main feed are placed in a container and given a preliminary mixing, then the quantity of molasses desired is added and the mixing is continued until a good mix is obtained. Batches can be turned out in from 15 to 20 minutes. Some farmers have constructed their own batch-mixers using a "tumbler" on the order of a concrete mixer, or revolving churn. For the large feeders, batch-mixers may be purchased.

Molasses can be mixed with little difficulty at 70 degrees Fahrenheit and there is no advantage in heating above 100 degrees, as the warm molasses cools quickly upon contact with cold feed. In any heating system, the surface in contact with the molasses should not exceed 250 degrees F. because above this temperature the molasses tends to caramelize or burn.

Mixing water with molasses is the simplest means of making the fluid more mobile and making it easier to mix and handle. This should not be done if the feed is to be stored for more than a few days. Molasses is readily soluble in water and will not "settle out" once it is mixed. Mixtures of 10% (1 gallon water to 6 gallons molasses) to 25% (1 gallon water to 2 gallons of molasses)

water by weight are most commonly used. Mixtures up to 25% water do not freeze at temperatures as low as 10 degrees above zero (Fahrenheit).

What is the feeding value of molasses as compared with corn? Have there been any experiments along these lines? One of the more recent experiments was conducted in Nebraska. A test with 50 yearling Hereford heifers was started October 31, 1936, at the Nebraska experiment station. The animals were divided into five lots of 10 animals each. They averaged 513 pounds, graded high-good to low-choice as feeders and at the outset were considered in thin feeder flesh.

The base ration for all lots consisted of drouth-damaged corn silage, cotton-seed cake 1½ pounds and limestone 1-10 pound per head daily. Each lot had a full feed of silage. The experiment was divided into two phases, one of 75 days duration and one of 59 days duration. All but Lot 5 were fed the first 7 days without change in the ration. Lot 5 started without grain or molasses and from the 50th day on, received a full feed of molasses and corn, half and half. The rations were as follows:

	First 50 Days (50 Days)
Lot 1	6.3 lbs. Molasses
Lot 2	8.3 lbs. Molasses
Lot 3	8.3 lbs. Cr. Corn
Lot 4	4.5 lbs. Molasses 4.5 lbs. Cr. Corn
Lot 5	

The silage used was from the 1936 crop of corn which was drouth-damaged. It made no grain and yielded on the average about 1½ tons of fodder per acre. Other than for the absence of the corn kernel, it was good silage. Cottonseed cake was the standard choice pebble-sized cake, containing 43% protein. Limestone was finely ground limestone averaging 98% calcium carbonate. Molasses was ordinary cane molasses averaging around 52% invert sugar. Cracked corn was No. 3 yellow corn, coarsely but uniformly cracked. The silage, cottonseed cake and limestone were fed together and the molasses and/or corn, or both, spread over the silage at each feed, morning and evening. The molasses was not diluted with water but fed as it came from the barrel.

While not conclusive, this experiment demonstrated in all respects that molasses can be used to good advantage in the fattening of cattle. Though fed in quantities up to 15 pounds per day with silage, cotton-seed cake and limestone, it had no detectable detrimental effect upon the health of the animal. Liberal molasses feeding did not cause scours or excessive looseness, nor was there any digestive disturbance in any

lot at any time during the experiment.

Lot 1 (5.6 Pounds Molasses 75 Days, 5 Pounds Molasses and 11¾ Pounds Corn 59 Days)

The first 75 days was 175 pounds or 11 pounds per head less than Lot 3, which was fed 10 pounds of corn. The cost of gain was $3.51 per hundred less than the corn lot. During the second period of 59 days, the addition of 11.78 pounds of corn to the ration held gains about 2 pounds daily and the combination of corn and molasses as fed in this lot proved the most profitable of any ration in the series. Molasses fed in this lot over the 134-day test returned a value of 102% as great per pound as the corn fed to Lot 3 when based upon replacement value. The high value for molasses in this case is due to the fact that a large part of the gain made during the first 75 days was upon silage.

Lot 2 (10 Pounds Molasses Per Day First 75 Days, Then Full Feed Molasses 59 Days; No Corn)

Feeding all molasses did not prove practical financially. While it was not injurious to the health of the animal, it did not produce a satisfactory finish on the cattle, resulting in a lower sales value. During the first 75 days, the gain this lot made was but 10 pounds less than Lot 3 (corn) and the cost was $2.27 per hundred less. During the last 59 days, however, the gain was 55 pounds less than for Lot 3 getting an equal amount of corn and the cost of gain in Lot 2 was $7.36 per hundred higher than for Lot 3 (corn). On a replacement value basis, molasses as fed to Lot 2 proved to be worth 86% as much as corn in the first 75 days. For the 134-day experiment, molasses as fed to Lot 2 in this test showed a replacement value of 66% as compared to corn.

Lot 3 (10 Pounds Corn 75 Days, Then as Much Corn as Lot 2 Received of Molasses 59 Days)

This lot has already been discussed in connection with Lots 1 and 2. It serves as the check lot of the experiment.

50 to 75 Days (25 Days)	75 to 134 Days (59 Days)
5.7 lbs. Molasses	5.0 lbs. Molasses
	11.9 lbs. Cr. Corn
10.0 lbs. Molasses	14.0 lbs. Molasses
10.0 lbs. Cr. Corn	14.0 lbs. Cr. Corn
5.0 lbs. Molasses	5.0 lbs. Molasses
5.0 lbs. Cr. Corn	9.0 lbs. Cr. Corn
7.0 lbs. Molasses	9.8 lbs. Molasses
7.0 lbs. Cr. Corn	9.8 lbs. Cr. Corn

Lot 4 (Corn 5 Pounds, Molasses 5 Pounds First 75 Days; Then Molasses 5 Pounds and Corn 9 Pounds 59 Days)

Though the gains made by this lot were quite satisfactory the first 75 days, the results the last 59 days indicate it would have been more profitable to have

saved the corn during the first phase and used part of it during the latter part of the test to produce a good finish. The cattle in Lot 4 were fatter, brought more money and graded higher in the carcass than Lot 2 (all molasses), by virtue of more finish, but because of a greater feed cost, the net return was less.

Lot 5 (No Corn or Molasses 50 Days, Then Full Feed Corn and Molasses—Half and Half 84 Days)

This lot produced the same total gain as Lot 3 (corn) and but 3 pounds less than Lot 1, the high-gaining group. The cost of 100 pounds gain was second lowest of the five lots. Molasses proved 84% as valuable as corn when compared to Lot 3 on replacement value basis. Withholding corn and molasses during the first 50 days and then full feeding used as much of these feeds as in Lot 1, and thus effected no saving on concentrates.

Porker Pyramid

Condensed from Successful Farming

Roy P. Stewart

IN the fall of 1935 at Hydro, a central Oklahoma town of 948 people, a young man and some boys started building a pyramid. It was not a structure of wood or stone, but of swine, erected in a locality which held no such edifice and which sorely needed one. It was erected by skilled workmen and, in seven hog generations, it has become one of the most outstanding pork projects of the Midwest.

Charles Hogan, genial vocational agriculture instructor at Hydro, is construction foreman. His helpers are members of the local Future Farmers of America chapter, and those progressive adults who realize their community livestock can bring cash or chaos, just as they please.

Cornerstone of the pyramid building program was 12 gilts and 12 barrows owned by 12 boys. On December 15, 1938, where three and one-half academic years before there had been only an uncertain foundation of grade hogs in the community, the base of the pyramid rested solidly on 82 registered breeding swine valued at $3,350, owned by 42 Future Farmers of America members. The boys also had 80 purebred spring show barrows on feed to supply quick profit and repay purchase loans and feed cost!

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Adults of the area now own more than 40 head of purebred sows and five purebred boars. There is also an adult registered breeder in the community for the first time—all of which means more money in Hydro.

In three and one-half years of competition at major and minor shows and fairs, for all types of exhibits and judging contests, these FFA boys have won $1,840 in premium money. They bought their first dozen breeding gilts in the fall of 1935, and in the spring of 1937 alone they sold 128 head of young pigs for a total of $1,872.50, just over an average of $14.62 each. That is one shining stone in the pyramid, because you can buy a grade weanling in the community for a top of $5.

But look at another stone in the structure: From July 1 to December 15, 1935, they sold $2,974.50 worth of boars, bred gilts, barrows, and young gilts, of which $550 was within the community and the rest to other localities all over the state. These boy breeders have sold more than $7,000 worth of hogs in three years.

More of their swine could have been sold to their neighbors this year, but they are following specifications and do not want to weaken the pyramid. They know that scarcity of home-raised feed and general diversified farming practiced on the sandy-loam soil of the area make it easy to get overstocked. Care and records are the rods which reinforce the porker pyramid which these boys are continually building—genetics is the mortar which holds the stones together. These boys take pride in what they are building!

So do many of the most alert farmers and the businessmen of the little town. They attend chapter meetings, they follow the boys to shows and fairs, and encourage them with the fervor of fans following a championship football team.

Hogan and the boys appreciate the aid which adults extend them, but they have discouraged the idea of being *given* anything. The two banks each lend from 12 to 15 boys an average of $50, in individual amounts ranging from $25 to $125, at two major buying periods of the year. Their total loans vary from $2,500 to $3,000 a year. With but few exceptions where a father's name is required, all notes are made on the boy's own signature with the purchased stock as collateral.

All boys are encouraged by Hogan to borrow money to buy stock if they do not have it from their own earnings or savings, rather than get funds from their parents. "That is good business training," he said. "More than that, it gives a boy a personal feeling of responsibility toward his project and its care."

A local grain company will supply feed to any FFA member on open account if the instructor okays the project—not the bill, but the undertaking. After spring and fall show seasons are over or weanling pigs are sold, current projects are closed, and the feed man and banker are paid. The lumber yard also extends the boys credit to buy materials for farrowing houses, creep feeders, sheds, and other outbuildings.

Only 12 boys wanted swine-feeding projects in 1935, but at the 1936 state fair, where more than 600 swine were shown in the junior division, 16 boys exhibited 28 head of barrows for a winning average of over 50 percent. During that fair, an incident occurred which brought into the Hydro chapter its first outstanding blooded swine and supplies a worthy example of why this community is hog-wild. Harry Knabe, well-known Nebraska Hampshire-breeder, was exhibiting at the Oklahoma Exposition and had a sow that farrowed there. She had placed second at the National Swine Show and had been bred to "Line Rider," later grand champion boar of the 1938 National Show, and a fine individual.

Following the custom of big breeders who cannot care for young pigs on a show circuit, Knabe sold the litter of eight when they were two days old. L. L. West, Jr., and his brother Marion, of Hydro, bought two males and a female for $3 each.

They took them home and raised them by hand. At two months of age their weight averaged 50 pounds. One male was then sold.

The remaining boar was put into service late in the spring of 1937 and was used until the fall of 1938, when he was sold outside the community to prevent inbreeding. He bred 150 sows with an average production of eight pigs per litter. At the 1938 spring fat show, all Hampshires except five which finished in the money were the get of this sire or his littermate. That was 14 out of 19 premiums, in a breed showing of 96 head, and it included the champion Hampshire of the vocational division!

Back home, 12 more boys started swine projects, 12 more fathers got interested in hogs which careful feeding and handling would mature so quickly, and many neighbors began to lean on a hog-lot fence.

Facts on Vitamin E

Condensed from Everybody's Poultry Magazine

L. C. Norris

Cornell University

A GREAT deal of attention is being directed to the vitamin E requirement of poultry. Much emphasis is being laid upon the possibility that good poultry rations may not contain enough of this vitamin. It is felt that as a result of a partial deficiency of vitamin E, normal hatchability frequently is not obtained and that the vitality of chicks is affected in such a way as to predispose them to fowl paralysis and allied conditions.

Vitamin E is not one of the newer vitamins. Its discovery was first announced by Evans and his associates of the University of California in 1922. Only two animals have been definitely shown to need this vitamin. These are the rat and the chicken. In these animals vitamin E is needed to prevent the death of the growing embryo and the development of sterility in the male.

The experimental work showing that this vitamin is essential for the maintenance of hatchability and fertility in poultry was reported by Card and his associates of the University of Illinois in 1930. These investigators fed an all-mash ration to a group of Rhode Island Red hens in which the vitamin E had been destroyed by treatment with an ether solution of ferric chloride. After being fed this ration for about six months none of the eggs of these hens hatched upon mating them with males of proven fertility. Then each of the hens was fed daily one-half c.c. of wheat germ oil, a rich source of vitamin E. An almost immediate response was obtained and within a few weeks the hatchability of the fertile eggs increased to 69.4 per cent.

Finally, the feeding of the wheat germ oil was discontinued, and within a short time afterwards, the hatchability of the fertile eggs dropped to 3.4 per cent. These results are generally accepted as establishing the fact that vitamin E is necessary for hatchability in poultry.

No reliable experimental evidence has yet been reported, demonstrating that an improvement in hatchability can be obtained by supplementing good

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poultry rations with extra vitamin E. Card was the first to attempt this, but the hatchability of the eggs of the group of hens fed wheat germ oil was slightly poorer than the control group.

On the other hand, Ender of the State Vitamin Institute of Norway reported a marked improvement in hatchability as a result of feeding wheat germ oil in connection with a good ration. Ender's experimental work, unfortunately, was not conducted with suitable control measures. As a consequence of this, the improved results can as well be explained by an improvement in egg production or some other cause as by the feeding of wheat germ oil.

In 1938, Davidson and Schaible of Michigan State College confirmed the earlier work of Card. They fed one group of hens a normal ration and a second group the same ration supplemented with 5 per cent of wheat germ meal. The average hatchability of the fertile eggs of the normal group was slightly but not significantly better than that of the group fed the wheat germ meal.

Further information on this problem is provided by some hatching results obtained at the Cornell Poultry Department during the hatching seasons of 1937 and 1938. In each of these years, flocks of hens of comparable quality were maintained to meet the outside demand for chicks. The 1937 flock was fed a good breeder ration containing 2 per cent of wheat germ. The 1938 flock was fed a similar ration except that it contained no wheat germ. The hatchability of 3,500 fertile eggs from the 1937 flock fed wheat germ was 76.3 per cent and that of 4,495 fertile eggs from the 1938 flock fed no wheat germ was 83.4 per cent.

In the case of another group of hens of special breeding, the 1937 flock fed wheat germ had a hatchability of fertile eggs of 84.1 per cent and the 1938 flock fed no wheat germ a hatchability of fertile eggs of 78.1 per cent. The differences obtained in this work represent normal variability. No evidence was obtained that additional vitamin E favorably influences hatchability.

The requirement of roosters for vitamin E does not appear to be very great. Adamstone of the University of Illinois made a study of the effects of vitamin E deficiency on the tests of four Rhode Island Red males, using a ration in which vitamin E had been destroyed by treatment with an ether solution of ferric chloride. Mating experiments showed that after one year, all of the males were capable of fertilizing eggs, but that after two years, some of the males were sterile.

Sawyer of the Western Washington Agricultural Experiment

Station, Cole of the Cornell Poultry Department, Jungherr of Connecticut State College and Barber of the New York State Veterinary College attempted to cure fowl paralysis by feeding wheat germ oil and by injecting it into the muscles or the body cavity. In all instances groups of non-treated hens were maintained as controls. In both the treated and the non-treated groups an occasional hen appeared to recover, but the general conclusion was that wheat germ oil and, hence, vitamin E is entirely ineffective in curing fowl paralysis.

Jungherr, in what was believed to be a crucial experiment, partially removed lymphomatous tumors of the ovaries, a condition allied to fowl paralysis, after which the birds were treated with wheat germ oil. In spite of the treatment, the tumors increased in size four to five times. Similar negative results were reported by English workers at the 13th International Veterinary Congress.

Upp and his associates of the University of Louisiana made a study of the value of wheat germ oil in curing iritis in poultry, a disease of the eyes believed in general to be of the same origin as fowl paralysis. They fed the oil for about one month to one of two groups of hens, equally matched in severity of eye symptoms.

At the end of the experiment, the eye symptoms in the treated group were still as severe as those in the non-treated group. Upp concluded from this work that no evidence was obtained in support of the contention that vitamin E will cure grey eyes or blindness in hens in a short time.

Davidson and Schaible of Michigan State College studied the value of wheat germ meal in preventing fowl paralysis and allied conditions, using two lots of White Leghorn pullets each of which contained 90 pullets. The control lot was fed an all-mash laying ration, and the other, the same ration supplemented with 5 per cent of wheat germ meal.

At the end of the 11 months' experimental period, the mortality from fowl paralysis and allied conditions in the control lot was 25.5 per cent and that in the wheat germ meal lot 26.1 per cent. In this experiment, no evidence was obtained, therefore, that vitamin E exercises any effect in preventing the occurrence of these conditions.

From the results which have just been discussed, it does not appear that hatchability can be increased or fowl paralysis and allied conditions reduced by fortifying the ration with extra vitamin E supplied either by wheat germ or by wheat germ oil. This appears logical in view of the presence of vitamin E in many of the poultry feedstuffs.

Corn, wheat, oats, the wheat by-products, alfalfa meal and fresh green grass are good sources of the vitamin. In cereals, the vitamin is concentrated in the germ. Crude corn germ oil and oat germ oil are excellent sources of vitamin E, while wheat germ oil is the richest source known. Most animal tissues and egg yolks are also good sources of the vitamin.

Except for sensitivity to rancidity, vitamin E is a very stable vitamin. It is destroyed by those oxidative changes which accompany the development of rancidity in fats and oils. In cereals and their by-products and in leafy green plants, the development of rancidity is retarded by the presence of substances, called antioxidants. It appears, therefore, that the feeding of rations which are partially deficient in vitamin E as a result of the development of rancidity is remote as long as freshly milled feedstuffs are used in poultry rations and as long as these rations move to poultry farms within a few weeks after manufacture.

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A New Industry for the Farmer

H. C. Bartholomew

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DURING December of this year the first National Convention of Locker Plant operators was held at Des Moines, Iowa. This baby industry of a few years ago is rapidly approaching maturity. A recent article stated that already one million families throughout the United States were patronizing the service offered by the locker storage system.

Just as factories once sprang up with mushroom rapidity at the sources of supply of raw material, so the locker storages are welding shorter links in the economic chain between producer and consumer.

"Quick Frozen" or "Frosted" is a term that has become generally accepted as meaning food that has been taken at its prime of maturity and suddenly sealed, being held in a state of suspension by the application of intense cold. This is no longer something confined to the experimental laboratory, or a few highly specialized processing plants. It is something that can be done by every community that produces food, an activity in which each individual in a community may participate. Peas, lima beans, asparagus, corn, strawberries, peaches and other fruits and vegetables that reach their prime in a relatively few hours, when consumed months later, will have all the delicate flavors and vitamin value originally possessed before internal activity was suddenly arrested. This is also true of animals or fowls slaughtered in their prime regardless of weather or prevailing market conditions.

A complete locker storage plant has the necessary facilities to handle the food as it is produced, be it freshly gathered vegetables, poultry, or live stock on the hoof, and to properly process it and store it in the patron's locker in zero temperature for future consumption. The locker storage owner or owners also function as brokers between producer and consumer helping to maintain an economic balance. The locker plant in many cases retails cut meat and manufactures sausage and scrapple and renders lard on a profitable basis at prices that attract the people of the surrounding country side.

The locker rooms themselves are spacious and well insulated having tiers of white enamel lockers in rows similar to a large

filing room. Each door has an individual key held by the patron or kept on a big board in the office.

Until recent times, many people have thought of frozen food as something inferior, associating it with the term "Cold Storage" that meant to them surplus meat and poultry already past its prime hurriedly crated and placed in rooms held slightly under freezing. Under these conditions it was slowly frozen with the formation of large ice crystals that punctured the delicate structural cells. When meat frozen in this manner is thawed the juices will filter out and the original flavor will be almost entirely lost. A portion of this change is also caused by the growth of bacteria and propagation of mold spores. This microscopic activity does not cease at temperatures just below freezing.

In the newly developed process of quick freezing it is necessary to maintain high standards of sanitation and to provide adequate means for the quick removal of animal heat. After the initial cooling period the carcass should be hung in a clean aging room maintained at a temperature of 34° to 35° with a proper moisture content and allowed to age. The process affects the fibre structure of the muscle and has a tenderizing effect. After the aging period that lasts for two to three weeks depending on the kind of meat, it is cut into steaks, chops, and other popular cuts. Each piece is wrapped in parchment paper, marked with the name of the owner and placed on racks in a room maintained at 10° to 15° below zero. Best results are obtained when the packages are spread on wire mesh to avoid direct contact with flat cold surfaces and cold air is rapidly circulated throughout the room. In this manner, freezing takes place evenly and quickly. This results in the formation of small crystals which do not rupture the cells and do not alter the original appearance of the product when it is allowed to thaw before cooking.

After the product is thoroughly frozen it is removed immediately to the individual lockers and held at an even temperature of zero or slightly above.

Best results are obtained with some vegetables when they are blanched with hot water just prior to being placed in suitable small cartons for quick freezing. Some berries and fruits require the addition of a small amount of sugar or syrup.

A locker storage may be operated successfully either by an individual or by a group sharing in the profits and convenience. In many cases a rural co-operative may extend its activities and make use of an existing building or make necessary extensions. It

is certainly advantageous, as in any business venture, to capitalize on a location where people have been in the habit of gathering to trade or a point well located in the community, with good facilities for transportation.

Already legislation has been set up in some States to govern the locker industry just as it has to govern other food packing plants to safeguard the health of the community.

A locker plant should have the necessary facilities to carry out all the operations required for the quick freezing and storage of food.

Insulation of the low temperature rooms should be the best. This is a fixed investment and is a large factor in determining the size of the refrigeration machinery. When a space is colder than the surrounding atmosphere there is not only a sensible heat transfer thru the insulated walls from the warmer to the colder, but there is a pressure difference between the water vapor in the cold space and the water vapor in the warm outside air. This pressure causes the water vapor in the surrounding warm atmosphere to penetrate the insulation, if not sealed, and freeze within the walls. Once this has taken place the insulation value is partially destroyed and the insulation material may actually bulge and break loose. It is not only necessary to use the best insulation but it is also important to seal the insulation against moisture infiltration.

The refrigerating machinery is the most important mechanical equipment in the locker plant. Frosted food must not be subjected to varying temperatures during the storage period and the machinery should be adequate to fulfill peak conditions. Two refrigerating machines interconnected with one unit capable of maintaining temperature in the locker storage compartment will provide sufficient safeguard against mechanical failure.

Equal attention should be given to the size of the refrigerating machine itself and the amount of cooling surface provided in the cold compartments. This is particularly true of the sub zero and zero rooms. The capacity of any refrigerating machine to absorb heat falls off rapidly as the temperature is reduced, while horsepower to operate the machine does not change in the same proportion.

Inasmuch as the power cost to maintain temperatures in the locker plant is a major operating expense, the refrigeration system must be automatic and be properly balanced, with operating cost, rather than first cost, being the major consideration.

The most valuable employee in a plant of this kind is the butcher,

who must be not only familiar with all the branches of his trade, but be a good merchandizer and gain the confidence of the patrons. It is the butcher who meets the public and both buys and sells.

From the point of view of the patron, the locker storage plant offers fresh wholesome food, cheaper than it may be obtained elsewhere.

Food produced at home is processed for charges that do not exceed one to two cents per pound, depending on current rates and the kind of food stored. Lockers usually rent from ten to twelve dollars per year and have a capacity of two hundred and fifty to three hundred pounds of meat storage or an equivalent volume for the storage of other food. Vegetables and fruit may be easily handled in season regardless of market conditions and may be preserved with a minimum amount of labor. The best cuts of meat may be had for practically half the cost of equal quality in the retail butcher shop.

If food must be purchased for processing, it is customary for the locker plant to charge a small fee to act as broker and then process and store the food. Those who produce beyond their own needs therefore find a ready market that is in turn profitable to both buyer and seller and practically eliminates loss by spoilage.

A study of locker plants in operation has shown that they should be built with not less than 375 to 400 lockers in order to have sufficient revenue to pay well. A good plant completely equipped will cost on the average of $30.00 to $35.00 per locker. Increased revenue should be derived from over-the-counter sale of cut meat together with the manufacture of sausage and scrapple and smoked meats. Restaurant trade also offers a good volume of business.

The locker plant system has passed thru the experimental stage in the mid-West and many new plants are under construction on the Eastern seaboard.

The History and Tradition of Fox Hunting

Condensed from Acco Press

Senator T. H. McGregor

THE story of the Chase is older than the recorded history of man. It finds evidence in paintings, carving and stones exhumed from the tombs and graves of Kings and Emperors whose activities still challenge the wonder and curiosity of man. The dog was man's first domesticated animal.

His courage and loyalty have been the theme of poets everywhere and the subject of essays and orations in every language which men have spoken.

Nature has supplied every essential to the accomplishment of a natural need. Man had to eat to live and whether the injunction "in the sweat of thy face shalt thou eat bread" was or was not divine, it was true. And to eat man had to subdue nature which had spread before him a banquet. Man soon learned that the dog was his natural ally in this conquest of nature. Nature provided the dog with speed, courage and stamina and gave him the power of scent with which to arouse and pursue those animals desirable by man for food and raiment, and gave to him the marvelous melody of the deep-mouthed cry that man might follow him from the start to the capture and the kill. Thus the Chase originated out of man's necessity. It was first an occupation and a pursuit in man's progress and the development and subjugation of nature to supply his wants and to provide for his necessities.

Thus the Chase became one of the first and most important of all occupations, universal in its nature and followed everywhere. So important, so necessary was this occupation to man's well-being and survival that it became involved in and was recognized in the religious ceremonies of historic and pre-historic peoples.

The Polytheistic Greek among his multitude of Gods and Goddesses, in his poetic imagination created the Goddess of the Chase and builded to her shrines, dedicated to her songs and stories and gave to her an exalted and outstanding position in their Greek Heaven on Towering Olympus.

In the course of the development of the Chase men began to pursue it for sport and pleasure as well as for a livelihood. Caesar

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tells us that he found that one of the tribes against whom he went in his Gallic wars followed the Chase for sport rather than for gain.

And so the Chase was developed, and as it developed its followers under a crude process of natural selection evolved the present day fox hound. The original purpose in this process obtains today—which is for a hound with looks, strength, speed, courage, stamina, loyalty, nose and cry. The French over-bred for size, and the English for looks. The early chases in France were for stags, hence their breeding for size. They however, as early as Louis the 14th, were devotees of the Chase and developed a good hound.

Lafayette after his return to France sent home some of these dogs to General Washington and their bloodlines yet run through the veins of the Virginia hounds which are among the finest in the world. Washington was not only a devotee of the Chase and loved hounds but he was a methodical man and kept a diary of his daily doings and in this diary is recorded the actions and quality of these hounds.

The English hound has lost prestige in America. He has been bred for shape and color to the detriment of the better qualities of a fox hound. He has all but lost his cry, and has a foot which cannot sustain a hard drive in the rugged terrain of America. The result is that the American hound in the fields and woods of Maryland, Virginia, Kentucky, Tennessee, and Texas are the best fox hounds in the world.

The essential qualities of a fox hound are nose—scent, cry, drive, or speed, determination, loyalty, honesty and stamina or the power to hold the line until the race is over. Bad hounds have many bad qualities and some good hounds have some bad qualities such as running mute, skirting, babbling, jealousy, and some are really dishonest. In every pack of hounds there is the strike dog which trails and jumps the fox and runs true to form from start to finish.

Riding in the foothills west of Austin near sundown I came upon a clearing and saw an old negro leaning upon a post. He seemed to be unconscious of my presence and I said to him: "Old man, what are you doing?" He said: "Listen boss, jess listen at dat houn'." I listened and I could hear the marvelous melody of a deep mouthed fox hound as it seemed to rise and fall in the cliffs and crags of the hills. Closer and closer it came when suddenly a magnificent hound swung into the clearing and with a tremendous burst of speed he reached the timber on the other side and "passed in music out of sight." Then he seemed to turn and here

he came again with the same witchery of sound, and with the same tremendous speed he again passed through the clearing and again the hills and valleys rang with the melody of mingled mouth and echo, and I said "Look here old man, that fox did not come back through there." And he said "No, boss, no dat dog runs 'em both ways. Dat's de reason he don't catch 'em." The trained and tried fox hound—the strike dog, never heels a fox. When he strikes a trail he knows which way that fox went and he follows the line he leaves. To do this requires two qualities—nose —scent, and honesty.

I have been speaking of a lot of hounds rather than a pack of hounds. A lot of hounds is made up of all sorts of hounds of different manners and mouths and dispositions. A pack of hounds not only suggests but assumes uniformity. Their mouths match like bells of different tones and power blending a beauty of sound and harmony which gives us a thrill experienced from no other source.

It is this unity of action, the existence and recognition of individual responsibility which adds a charm and an effectiveness to a pack of hounds. They demonstrate as a truism the statement of Sallust that by concord small things are made great, by discord great things are made small.

The hound has been the aristocrat and companion of the rich and the Royal, the pet and plaything in palace and mansion; the Democrat with the poor and the humble, in hut and in tractless forest.

It took three pioneers to subdue this country of ours and change its far-flung frontiers into busy cities and happy homes—man, his horse and his hound. The American horse, as a pioneer, has been cast in bronze and chiseled in stone and placed in the busy marts of crowded cities as testimonials to the part he took in the development of this wonderful country, while the story of the pioneer hound is embalmed in our literature, traced upon immortal canvas, and finds expression in the hearts of our people.

Wintering the Flock

Condensed from Sheep Breeder

Delmer H. La Voi

National Live Stock and Meat Board

WINTER feeding and management has a direct bearing on the general welfare and paying out ability of the breeding flock. Many flock masters have experienced heavy losses at lambing time because of neglect of some important practice during the winter feeding period. Correct care and feeding of the ewes during gestation period is invaluable in determining the general strength and health of the new born crop of lambs.

Although the systems of feeding and management vary in the different districts in this country, the general fundamentals of the business are about the same. Good methods, and systems of management coupled with a knowledge of the business are essential factors everywhere. The most important general principle the flock master must keep in mind is to satisfy the specific requirements of the animals at hand. These requirements will change from time to time during the progress of the gestation period and it is a knowledge of these developments which enables the informed or experienced flock master to be successful. In addition to these developments, other factors, such as the fleshing of the ewes, the time of lambing, age of the ewes and the kind and cost of the feeds on hand, must be considered.

Ewes which go into winter in good condition can be handled most economically and it should be the aim of every sheep man to see that the ewe flock makes a constant gain in weight up until lambing time. This does not mean that they should be excessively fat, a condition to be avoided, but they should be thrifty and gaining in flesh. If the ewes are handled occasionally it is an easy matter to determine their condition. Flocks which are exceedingly thin in the fall are not as good producers and more costly to handle because they require greater amounts of feed during winter.

While sheep will consume large amounts of coarse roughages, good results can be expected only when one to one and one-half pounds of legume hay is fed per

Reprinted by permission from the Sheep Breeder, Chicago, Ill., Nov., 1939

head daily as the basis of the ration. The best feeds and those highest in food value should be saved until near lambing time, while the poorer, coarser feeds containing less digestible nutrients should be fed earlier in the season. A study of the development of the fetus shows that one-third of its growth is made during the last month of the gestation period. It is at this time that the ewes need the best feed and those of concentrated nature if the requirements of the ewes are to be satisfied. It is recommended that ewes be fed grain from one month to six weeks before lambing regardless of their general fleshing. If they are in good flesh at the start of the gestation period, they will need very little grain, if any, until previous to lambing time, provided they are receiving at least one and a half to two pounds of some leguminous hay in their ration. Ewes which are receiving rations consisting of only coarse roughages of low feeding value, such as straw, timothy hay or cornstalks are susceptible to prelambing troubles and should receive grain throughout the gestation period. Pre-parturient paralysis is one of the most common troubles with ewes fed such rations. They eat excessive amounts of coarser feeds to satisfy the increasing demands placed on their system and their bodies are not able to assimilate these feeds with the result that constipation and paralysis of the digestive system develop. This, in turn, is followed by a general paralysis of the entire locomotory system. In addition to this, the ewes so handled are usually poor milkers and many fail to own their lambs. Lambs dropped from these ewes are often small in weight and improperly developed. Conditions of this kind are also found where ewes are required to obtain too large a part of their winter ration from the "weathered" grasses of low feeding value which are found on the range. A flock of breeding ewes require proper attention if they are to be profitable. Ewes fed a liberal ration with regularity and provided with quiet clean quarters seem to do the best. They will show less death loss, produce stronger lambs, raise and own a larger percentage of their lambs, and will grow heavier fleeces.

Sheep thrive on a variety of feeds, but many flocks today are being wintered entirely on legume hay. This is not necessary providing the ewes are in good flesh and are receiving some leguminous roughage. Legumes are valuable because they are well supplied with protein and contain the necessary vitamins. In cases where legume hays are not available, it is advisable that the flock be fed grain in addition to the

roughages of lower feeding value. While oats are unquestionably the best single grain for breeding ewes, corn or barley may be used advantageously when leguminous hays are fed. When the cheaper roughages such as silage, corn stalks, and straw are being fed from one to one-fourth pound of some protein concentrate should be fed per head daily. A mixture of equal parts of corn, oats and bran is an excellent ration for breeding ewes receiving legume hay and when the cheaper roughages are being fed one-half part of some protein concentrate should be added to the above grain ration.

The use of silage and roots is recommended in supplying succulence to the ration. Neither should be fed in large amounts, two to two and a half pounds of silage and three to four pounds of roots daily are sufficient. If fed in excessive amounts, they may cause weak and poorly developed lambs. Neither of these feeds should be fed if spoiled, moldy or frozen. This applies to all feeds fed to sheep. It is not considered necessary to grind grains for ewes unless they are aged. Aged ewes of this kind will also do better if separated from the remainder of the flock.

Some method should also be considered whereby the breeding ewes are required to take daily exercise. In some parts of the country where the ewes run on winter pasture this is not a problem, but in states further north where sheep are housed for the greater share of the winter season this must be taken into consideration. Various methods are followed, the most common perhaps is where the sheep are fed harvest feeds in the field. In other cases feed racks are scattered about in the yard and the ewes run from one to the other for their daily rations. Fields of cornstalks are also used, but in cases where this is done the ewes should be fed a good feed of some leguminous hay or grain daily. A few sheep men make it a practice to drive their sheep for daily exercise. Any one of these methods may be used, as healthy lambs are usually produced from ewes which have had plenty of exercise during the gestation period.

Sheep should be housed in well ventilated quarters, free from draft, and dry under foot and over head. Housing and equipment, as a whole, does not have to be elaborate. Twelve square feet of space should be allowed for the average-sized ewe, although this may vary with the size of the ewe and time of lambing. Eighteen inches of space should be provided for each ewe at the feed racks. This will help eliminate crowding. Some type of feed rack should be used that will help to keep the sheep from wast-

ing their feed. The arrangement of the racks crosswise in the barn rather than lengthwise seems to help eliminate crowding. The doors of the barn should be wide in order to give the ewes freer passage and they should not be required to walk over high door sills.

Internal parasites are extremely troublesome in some localities and it is advisable that flocks be drenched when placed in winter quarters. Many unthrifty flocks could be improved by this practice. Internal parasites keep the ewes thin throughout the wintering feeding season and make them unprofitable. In this state we have used the copper sulphate Black Leaf 40 treatment shortly before lambing without danger, except for cases in which the ewes were carelessly handled.

Another important factor that is overlooked by some flock masters is the proper care of the wool. A good fleece is reduced to a lower grade when it becomes chaffy. This usually happens when sheep are allowed to run to straw stacks or when hay, or other feeds are carelessly thrown over their backs at feeding time. The quantity and texture of wool are also materially influenced by the feeds which are fed. The ewes subjected to a sub-maintenance ration often produce fleeces of poor texture and weak staple.

Plenty of fresh water and salt should also be supplied to the flock.

When plenty of leguminous roughages are available it is doubtful if any additional mineral is needed. When the cheaper roughages are being fed it is advisable to keep before the sheep a mixture of equal parts of salt and special steam feeding bonemeal. In either case it is desirable to add two ounces of potassium iodide to each one hundred pounds of salt, or salt and bonemeal during the gestation period.

Although no mention is being made of rations, the exact amount to feed will depend on the size of the ewe and the time of the feeding period. The amounts of concentrated feed and grain are changed as the demands of the ewes are increased. Early in the season the ration may be composed entirely of roughages. One month before lambing it should consist of one-half to three-fourths of grain and after lambing one to one and one-half pounds per head daily together with sufficient roughages to satisfy their needs.

Stationary Spraying Equipment

Condensed from The Ohio Farmer

F. H. Ballou

THE stationary spraying plant referred to in this article was installed by the writer at our privately owned Dale View Trial Grounds in Licking County, Ohio, in the autumn of 1929. By mutual understanding at the time of installation this very carefully planned setup, which, as a matter of course, was financed from private resources, became and still remains the demonstration stationary spraying unit of the Ohio Experiment Station. As such it has been visited by a great many orchard owners of Ohio and neighboring states. Apparently there is as much or more interest in this type of spraying equipment at present as at any time during the past nine years.

Such equipment is simple, practical, dependable and long-lived. Heavy trucks are wholly eliminated. Teams and tractors have no occasion to enter the orchards during the entire spraying period. The vegetative soil covering of the orchard areas is neither destroyed nor injured in the slightest degree. Yet, upon every hand, the wholesome effects of proper sprays applied by powerful spraying equipment are clearly apparent. It is little wonder that owners of orchards situated on level or nearly level land, as well as those who grow fruits on steep, rough ground, become deeply interested in stationary spraying.

Two of the outstanding advantages of properly installed stationary spraying machinery which contribute largely to its long life of splendid service are that at all times it is securely sheltered from injurious weather conditions and never subjected to racking strains and shocks as are portable spraying units.

The disadvantages of a heavy-duty, large-capacity stationary spraying outfit are almost negligible. For small, inconveniently scattered bits of spraying, however, its very largeness and strength may be said to be its weakness. A small quantity of spray such as might be needed for a certain purpose would by no means fill the orchard pipe system. The main orchard pipeline alone at our Dale View Plant has the capacity of 200 gallons of spray mixture before beginning to build up pressure by filling

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the lateral lines of lesser size. For the reasons above given it is obvious that we have found the large stationary spray plant unsuitable for experimental spraying in which a considerable number of different sprays are to be used on equally numerous plots of small size. It has been the plan to reduce the number of competitive spray materials or formulas to three or four of the more promising each season, and at the same time greatly increase the size of the plots of trees to be sprayed.

Another feature of stationary spraying which, in the estimation of some orchardists would be considered a disadvantage, is the fact that application of sprays invariably must be made from the ground. There is no possibility of riding "in state" on an elevated platform, as on a "Big Bertha" of the modern, portable type. Spraying from the ground, if careful workmen be employed, is of a quality seldom attained from towers, platforms or seats of constantly moving, portable spraying machines.

Stationary spray plants of large size and capacity are suitable only for coverage of orchards of moderate to extensive acreages. The principle of stationary spraying, however, is so versatile, excellent and practicable that it may be utilized with a high degree of satisfaction under widely varying conditions. Were the writer to be limited to a five-acre tract of ground and still desired to grow tree as well as small fruits, he still would do all of his spraying with a stationary plant of suitable size and capacity. As a matter of fact small stationary setups for limited areas of orchards and home grounds, are every whit as practical and desirable as are the larger types for more extensive areas of orchards. Installed in a small, spare corner of the garage, basement or outbuilding near a convenient source of water, and connected with an orchard service line of ¾-inch pipe, a "pony stationary" will prove most wonderfully efficient, and will pay for itself over and over.

The stationary spraying outfit intended for heavy-duty service should be located at or near the source of water supply. A cistern of large capacity situated on higher ground than that upon which the spraying plant is built is an excellent arrangement. If the cistern be fed by gravity from a flowing spring located at a still higher level—so much the better. If there be no flowing spring the cistern may be filled from a well or stream by means of a power water-pump. If no natural elevation of ground be available on which to locate the cistern, the next best plan is to install a large tank on a sturdy sub-structure of

wood or steel, at a height to afford fair pressure of water. The tank, likewise, may be of either wood or steel.

The cistern or tank should be connected with the spraying plant by a conducting pipe two, three or four inches in diameter, by which to rapidly fill the spray tanks. A gate valve should be installed at the spray-plant terminal of the pipe, by which to control the flow of water.

A stationary spraying outfit may be set up out in the open but it is far better to provide neat, decent, substantial, permanent shelter for so expensive a piece of equipment. The building or section of building in which the sprayer is placed should be fitted with rolling or hinged doors so that at least three sides of the machinery and mixing room may be opened to allow of unobstructed circulation of fresh air. The floor should be of rich concrete six to eight inches in thickness resting upon a 12- to 18-inch layer of crushed rock solidly tamped.

Moulded in carefully prepared forms on the floor of the power and mixing room as soon as the concrete has "set" to a degree that will permit working upon it, should be substantial sub-sills of the same material, of exactly the proper length, and at the right distance apart to serve as the foundation for the motor, pump and tank assembly of the spraying unit. These concrete sub-sills should be at least six inches both in depth and thickness, with heavy (8x½ inch) bolts spaced from 30 to 36 inches apart, imbedded vertically, heads downward, in the sub-sills while the concrete is still soft. The threaded ends of the bolts should project from the smooth surface of the concrete a distance of about 4½ inches. These bolts are for the purpose of attaching wooden super-sills (single 4x6 or double 2x6 inch planks) upon which, in turn, the power and spraying unit is directly fastened by means of heavy lag-screws. The sills of wood, the machinery experts advise, provide a more resilient and preferable foundation for the heavy steel base upon which the motor and pump are rigidly mounted as received from the factory, than does concrete alone. The concrete sub-sills protect all wooden parts of the foundation from water and spray solutions.

There are various styles and sizes of spray pumps and motors made by different manufacturers that are well suited for stationary spray plants. The standard setup includes a high pressure pump, a gasoline engine or electric motor and a spray tank of such capacity as to permit preparation of a generous quantity of spray solution at a single mixing.

For convenient and really

economical operation of the plant as a whole, there should be two spray tanks. The simplest and most practical arrangement to provide the double-tank requisite is a single large tank divided into two compartments. Such a plan at the same time easily solves the problem of agitation of the mixture in both tanks, and permits a simple suction-pipe and dual valve assembly connecting with the intake of the spray pump. An ample opening on top through which water and chemicals are admitted permits access to the interior of the tanks for repairs or inspection. During active operation in spraying, one of the tanks is being filled and mixed while the contents of the other are being drawn by the pump and sent out through the pipe system to the sprayers in the orchard. Spraying in the orchard, therefore, is a continuous process —the gunmen not knowing when a change from one spray tank to another is made. The spray tanks are filled by a swinging arm of the water standpipe by gravity from the large cistern on higher ground.

Every high-pressure spray pump is provided with some method of pressure relief which permits excess spray solution passing through the pump to return to the spray tank. The return pipe should be assembled so that the overflow be returned to the compartment from which it is being pumped. If the surplus were to be discharged into the tank that is being filled with clear water, a mixture of unknown concentration would result. One of the two valves at the terminals of the overflow pipes must always be open.

A standard air pressure gauge is an indispensable instrument in connection with any type of power spraying outfit. All valves used in any part of a stationary spray plant that is subject to high pressures, should be of the "gate" type and of the very best quality obtainable.

The main pipeline of the stationary spray plant to and thru the orchard of 20 acres or more in extent, should be not less than 1¼ inches in diameter, inside measurement. The laterals, if not of unusual length, may be of ¾-inch pipe. If at all possible (and frequently it is), the main pipeline should slope downward toward the spray plant. This permits drainage of its contents back into one of the spray tanks when spraying is finished in the more remote sections of the orchard. A valve in the main line near the power plant is then closed and the returned solution sent out through a separate, lesser pipe system so laid as to conveniently serve adjacent parts of the orchard. This plan, during a full season's spraying, saves consider-

able valuable spray solution.

In the general layout of orchard piping the laterals are installed every fifth row of trees. Both main line and laterals are fitted with hose connections or "cut-offs" at intervals of about 80 feet (usually at every fourth pipe-coupling). This enables each sprayman to cover 15 to 25 trees from a single "hook-on" with the usual length of 100 feet of spray hose.

Orchard pipelines, under average conditions, are more satisfactory when laid on the surface of the ground beneath trees and close to their bases, burying lines a few inches in depth only where they cross regular driveways. At every low point in the lines, either "T" pipe-coupling with removable side-plugs, or regular ground-point pipe unions which may be quickly disconnected should be used for thorough drainage of the pipes when low temperature threatens. At the time of drainage it is a good plan to insert a small roll of copper or galvanized wire that will permit unobstructed drainage and exclude adventurous field mice.

When each spraying is finished and the main pipeline and spray tanks drained of spray solution, the tanks are immediately filled with clear water, pumping it into the entire spray pipe system until the usual spraying pressure of 500 to 550 lbs. is attained. An attendant then goes to each terminal of the pipe system, opens the terminal hose-valve or "cut-off," waits until the spray mixture is blown out and clear water is being discharged, then closes the valve. When all spray mixture has been forced out of the lines the pumping unit is stopped, the entire power plant cleaned up neatly and the spray hose and guns put away until the next spraying is due. The pipe system is permitted to remain filled with clean water.

After each season's spraying and before danger of freezing in late autumn the pipelines, as stated above, may be disconnected, thoroughly drained and stopped against small rodents, or the entire pipe system may be pumped full of oil (crank-case oil will do as well as any). This same oil treatment keeps the spray pump in excellent condition. A part of the oil may be drained back into the spray tank from the main pipeline before spraying time the following season; and pumped therefrom into a steel drum or other suitable receptacle; but a considerable proportion of the contents of the lateral pipelines will have to be forced out at their terminals where filling it into containers will prove a task as unprofitable as it is unpleasant.

Preparation of the pipelines for spraying the next season, where oil has not been used, will necessi-

tate complete reassembling of the sections where they were disconnected in autumn. Then it is a good plan to "walk the lines" sharply tapping the pipes with a hammer at every step. This jars loose any possible scale or sediment or rust. The spray tanks are then filled with clear water and the water forced into the pipe system. Again an attendant makes the round of pipe terminals, opening each valve in turn and closing it only when every evidence of sediment has been forced out. This preliminary test of the lines, too, will disclose any possible leaks that should be stopped before actual spraying begins.

During the nine successive years' operation of the stationary spray plant at the Dale View Trial Grounds, there has been no serious clogging of pipelines and very little delay from obstructed spray nozzles. No more trouble, indeed, than from well behaved portable outfits.

If the orchard being sprayed occupies a steep hillslope, the spraymen are instructed always to begin, if at all feasible, at its higher elevation and gradually work down the slope. By so doing they greatly lessen the labor of dragging the long lines of spray hose. Different topography of orchard land, however, will so vary the plans of attack in spraying that it is useless to advise and set rules.

The size of spray hose (diameter of bore) is an important feature of the stationary spraying outfit. At the outset of the writer's experience along this line he was advised by the manufacturers of the sprayer to use hose not less than ½ inch in bore and did so but one trial section of 100 feet of ⅜-inch hose proved so satisfactory that two more sections were ordered. The ⅜-inch lines were much lighter and easier to handle, and were suitable for the spraying work because the type of spray gun we like best for working from the ground, is especially adapted to use with such hose. The guns are of the short, single-nozzle, adjustable spray style, fitted with spray disks, the apertures of which are from $\frac{3}{32}$ to ⅛ inch in diameter. Under pressure ranging from 500 to 550 lbs. these hose and gun assemblies produce generous volumes of mistlike, penetrating sprays that are rapid in coverage and as satisfactory in results as we ever have had the pleasure of using.

Orchard owners who are sufficiently interested in stationary spraying plants as to desire discussion of the subject somewhat more in detail should address the Ohio Experiment Station, Wooster, Ohio, requesting Bulletin No. 572.

Buying Farms on Contract

Condensed from The Rural New-Yorker

A. H. G.
Jefferson County, N. Y.

THE purchase of a farm is the most important business transaction in the life of most farmers, yet frequently but little foresight is shown in its selection, and still less in the negotiation of the terms of purchase.

In the course of business it has been necessary for the writer to investigate the financial condition of several thousand farmers in one of the finest dairy sections of the country, including owners, share tenants, cash tenants, farm laborers and contract purchasers. Of these by far the poorest credit risks were the contract purchasers. Very few of them succeed in paying in full for goods purchased on the installment plan. Many of those whose financial statements were taken were no longer buying farms but had tried in the past and had had to let the farms go back.

The usual farm purchase contract in my section provides for a down payment of as much as the purchaser can scrape together, often replaced by a mortgage on the stock and equipment owned by him, and an order on the shipping station for half the proceeds of the dairy. This order is supposed to run until enough has been paid on the farm to enable the purchaser to finance the remainder on a mortage, but it seldom does. Under such a contract, the purchaser has to pay all household expenses, all normal, running farm expenses, and such extraordinary expenses as replacement of machinery and stock, and major repairs to buildings from the half of the milk checks he receives plus any other income which the farm may produce. In this section, there is little other income.

Of several hundred such purchasers, only two successful ones come to mind. One got a job driving the local school bus at a salary sufficient to pay his home expenses and some of the farm ones. The other had several sons, some of whom worked out and helped pay for the farm.

Of the large number who failed, the usual experience was as follows. The purchaser rented a farm and ran it on shares for several years, doing pretty well. The landlord offered to sell him the farm on a contract, he to continue to receive half of the milk

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checks. The deal did not seem so different from renting to the tenant, except that he was becoming the owner of the farm, so he accepted and continued to run the farm about as before. Before long he found out the difference. In this section it is usual for the landlord to furnish all the cows, to pay half of the feed bills, two-thirds of the taxes and all the repairs to the buildings. Usually he furnishes all the grass and clover seed and buys the hay if any is needed. These expenses now fell on the buyer. In the course of a year or two, some of the cows went bad and had to be replaced, and since expenses had kept him cleaned out, the buyer was unable to replace them or at least all of them. Shortage of money compelled him to curtail grain purchases, so the milk production dropped. Usually it was also necessary to skimp on grass and clover seed purchases, hence hay production fell. Then when the equipment and buildings started to need repairs with no money to spare to make them, the impossibility of completing the contract became apparent to both the seller and the buyer, and the farm went back to the original owner. The buyer lost all that he had paid in and the seller got back a farm with run down buildings, poor meadows, and a dairy that was good for little. Both lost by the transaction.

In one case, fire destroyed the buildings. The insurance went to the seller who refused to rebuild them. Nothing was left for the purchaser to do but move off. He had paid in $3,400. In another case most of the dairy was condemned for tuberculosis. As the seller had a mortgage on the cattle, he received the indemnity checks, and kept the money, the buyer having to move or starve.

Experience with letting farms on shares has shown that under normal conditions on dairy farms, the necessary expenses shared by the landlord and the tenant amount to somewhat more than one third of the gross income from the milk. Before the war it was almost exactly one-third, but expenses have increased faster than income. In addition the landlord has to make all repairs to buildings, replace cows which go bad, furnish fencing, pay machine cost of silo filling, insurance, hay if there is a shortage, and usually grass and clover seed.

At present prices for milk and the things purchased, it is safe to say that the shared expense would be at least 36 percent of the gross income from the dairy, and the landlord's expense not less than six percent, making a total expense for the farm of 42 percent of the gross income. Since the purchaser under such a contract receives only 50 percent of

the gross income from milk and has all the expenses to pay, it appears that if he kept up normal expenditures on the farm, he would have only eight percent of the gross income for his living expenses, to pay hired help, threshing, repairs on his equipment and possible replacement of this and of work horses. To make the figures concrete, the following figures for a 25 cow farm (about as large as one family can handle without hired help) are of assistance.

Income from milk	$2,500
Purchaser's share	1,250
Expenses, 42% of $2,500.	1,050
Balance net for purchaser.	$ 200

It is not strange that so few succeed.

In renting on shares, the landlord is furnishing the major part of the capital. Few landlords have averaged more than three percent income on their investment during the past 10 years. If landlords are willing to make this type of investment, the logical plan is to continue to rent on shares until enough is saved to be able to rent for cash. Then one can continue to rent for cash until he has enough capital accumulated to buy outright, and if one has a sufficiently large down payment, a very advantageous purchase can be made.

Some will still want to rush things and buy on a contract. These should never enter into a contract where the seller receives over 40 percent of the milk checks, and 35 percent would be considerably safer.

Superphosphate Magic Causes an Illusion

Condensed from Pacific Rural Press

WHAT would you think if you drilled your alfalfa seed east and west and when the rows came up they appeared to run north and south?

Something like that occurred near Yuma, Arizona and some of the things which Prof. I. A. Briggs, of the College of Agriculture, thinks about it are of wide interest to farmers all over this region.

It should be explained that before the alfalfa was drilled in one direction, superphosphate had been drilled into the soil in the opposite direction and that accounted for the fact that the rows seemed to have been twisted at right angles by the moon or the sun, or some magic. The alfalfa growing immediately above the drilled rows of superphosphate grew so much more rapidly that

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the illusion of rows running the other way was natural.

But that's only the beginning of the interesting story. Prof. Briggs carefully washed the soil away and studied the root development. As you might expect, he found the roots clustering around the rows of the superphosphate. No mystery about that either. But it leads to another interesting step in the lesson to be learned from this case.

As growers know, there is a great tendency for phosphate to tie up or be fixed the minute it touches the soil. This has interfered with many tests of superphosphates on soil which has by analysis shown to be deficient in phosphorus. If the phosphorus ties up in the first inch of soil it is removed from a large part of the root system and there have been a lot of experiments in what to do to prevent this fixation. It has been found that certain organic things, for instance glucose, will prevent the fixation, and the phosphorus can be carried down by the rain or irrigation water throughout the root area. But the problem of what to use on a large scale for this purpose is still being worked on.

Meanwhile here is an indication which Professor Briggs gleans from this test:

By depositing the superphosphate in a drilled row, the phosphorus on the outside of the drilled deposit in contact with the roots, might tie up quite promptly, but the phosphorus in the center of this little core of fertilizer would not be fixed. And thus it was probably more quickly available to the alfalfa than if it had been scattered, and incorporated in the soil.

With some crops it has been found advisable to practice fertilizer placement and put the fertilizer down to the depth where most of the roots can get at it, and it would appear that putting it all together in the trench or drilled row, such as was done in this case, is also good practice.

In this case the pictures of a cross-section of the plants and of the root systems certainly seem to be a big vote in favor of not scattering the fertilizer, but of putting it together. It was drilled three inches deep.

Contagious Abortion — The Next Conquest

Condensed from The Duroc News

W. E. Carroll
University of Illinois

THE increased prevalence of contagious abortion among the swine herds of the state is a matter of major importance to swine growers of Illinois. For some years the University of Illinois has been purchasing animals needed in its breeding herd subject to a test for this disease and is maintaining a herd negative to the test.

Two years ago last fall it was still possible to find a considerable number of herds that contained no reacting animals. This was particularly true of the smaller herds. Last fall the University had need of two boars of different breeds and covered an area of more than 200 miles long and 150 miles wide and found only one herd in which reacting animals were not discovered. This one herd consisted of a single litter that had been raised apart from other animals. Not enough samples were taken in any one herd to indicate the extent of the infection but the fact that is was found so widespread appears significant. In at least two bred sow sale catalogs that came to the office the conditions of the sale explained that abortions that occurred after the sows left the farm would not be considered the fault of the farm.

Not all abortions can be laid to the contagious form, but this certainly is one of the most likely causes under present conditions. Judging by the experience of the University herd, the loss from actual abortions in a reacting herd may not be particularly heavy even over a series of years. Such a herd appears, however, to be subjected to regular storms of abortion during which a large proportion of the sows—particularly the young sows—may lose their litters. Breeding troubles and the presence of immature pigs in otherwise normal, full term litters were more noticeable in the reacting herd than among non-reactors.

If such troubles were all that go with a reacting herd it is conceivable that the inconvenience of cleaning up and maintaining a negative herd might be considered by many to be greater than the risk involved. Swine abortion, however, has a health hazard for people that cannot be overlooked.

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The infection manifests itself in human beings as undulant fever, a disease that, although not highly fatal, is extremely persistent, incapacitating and treacherous.

I gather from veterinarians and physicians that the swine organism is more virulent for human beings that is the cattle organism. Just what the element of risk is to those who handle infected swine is not yet well understood.

Twice in recent years the herd at the University of Illinois has been cleaned up. This was done by frequent testing of the herd and the elimination of all reacting animals. In connection with one of the clean-ups, an observation was made that may develop to be a helpful step in making the transition from a reacting herd. The usefulnesss of the procedure is as yet purely speculative and is not given in any sense as a recommendation, as it involves only a single experience. In this case 18 sows that were definite reactors were farrowed apart from the non-reacting sows and placed on pasture entirely away from the swine farm. As each litter reached an age of 56 days the pigs were weaned, weighed and a blood sample taken from each pig. The pigs were then placed on another area on which pigs had not been run and again away from the swine farm. These pigs were tested periodically during the summer and in no test, either at weaning time or later, were any reacting animals found.

During late June and early July this year blood samples were drawn and tested for abortion from 48 herds in the process of obtaining young animals for a special experiment. From one to four pigs in a herd were sampled out and not one of the 85 animals tested showed a positive reaction. These pigs were from 2 to 4 months old and in most cases had been raised on clean ground and had been maintained apart from older animals since they were weaned. No check was made of the presence of the disease in the older animals of the herds and the few samples taken cannot be considered sufficient to indicate at all definitely the status of the herds with respect to the disease. Without doubt a number of them contain reacting animals. Unless and until the pigs selected remain negative to two or three subsequent tests, the observation will have no practical value. If the tests continue negative, however, it will give some weight to the suggestion that young animals are less likely to harbor the organism than older animals.

Studies that have been made indicate definitely that the abortion organism can live for considerable periods of time in the soil. It becomes necessary therefore, to

keep all non-reacting animals away from the area upon which reacting animals have ranged. How long this quarantine must be maintained is not known. It is supposed, however, that a period of several months will be required. This quarantine must include all hog lots and hog-lot equipment, though, of course, equipment that can be thoroughly cleaned and disinfected should be safe. Even this, however, is a small price to pay for a clean herd.

After a herd has finally and definitely eliminated all reactors, it can safely exchange animals only with similarly clean herds. Even animals from clean herds, as a matter of precaution, should be retained in quarantine for a period and retested. An individual breeder who attempts alone to develop and maintain an abortion-free herd will, of course, find his way somewhat restricted, particularly his patronage of public sales. A small group of breeders working together would encounter very little inconvenience, however. As swine growers become conscious of the desirability of eliminating this disease, imagine what a help in the campaign a nucleus of clean herds would be! Furthermore, breeders who undertake to provide breeding stock for other herds owe it to their customers to give them safe animals. Without question, the public sale has been a potent factor in the distribution of the infection to many herds. Such sales if based on abortion-free animals could now be equally effective in the elimination of the disease. Progressive breeders owe this much to the industry.

The machinery for the development of abortion-free herds is already available in Illinois through the local veterinarians and the Division of Animal Pathology and Hygiene, University of Illinois. Those who desire may obtain the service by becoming co-operators in Project 1046. The Animal Pathology Division will co-operate with owners and veterinarians and advise regarding the clean-up campaign. No charge is made for the test of blood samples that are drawn and sent in by local veterinarians. The Division will even supply sterile vials in which to draw the blood samples. For details, correspondence should be addressed to Dr. Robert Graham, Division of Animal Pathology and Hygiene, University of Illinois, Urbana, Ill.

A group of breeders in a given locality should be able to clean up their herds with little difficulty and thus become a source of safe stock that would be much in demand.

Lessons in Breeding from Beltsville

Condensed from The Ayrshire Digest

DURING the past twenty years, a carefully planned dairy cattle breeding program has been conducted at Beltsville, Maryland, under the direction of the United States Bureau of Dairy Industry. Although subjected to the customary criticisms that are levelled at scientific studies of this type, it is doubtful if there is any other research project in the world involving dairy cattle that has been so carefully controlled and that now provides such a wealth of information.

Experiences in the Holstein-Friesian herd at Beltsville demonstrate most convincingly that the use of proven sires has been effective in maintaining high production. According to Beltsville, results with Jerseys have not been quite as satisfactory as with the Holsteins, due to the fact that proved Jersey sires of the breeding desired have not always been obtainable. The average yield of ninety-eight daughters of five proved Holstein sires, bred and tested at Beltsville, is 705 pounds butterfat and the average yield of eighty-nine daughters of eight proved Jersey sires, bred and tested at Beltsville, is 679 pounds of butter. During the past twenty years, five proven Holstein-Friesian sires have been used in succession on a herd of selected high producers, with butterfat records averaging 678 lbs. fat, with the result that butterfat production has been increased. The average of the records of the daughters of each succeeding sire, made on three-time-a-day milking schedules, and figured to a mature equivalent basis, are as follows: first sire, 663 pounds of fat; second sire, 704 pounds; third sire, 646 pounds; fourth sire, 750 pounds; and fifth sire, 789 pounds of butterfat.

Although there has been a splendid increase in butterfat production, there has been but very little change in the amount of milk, indicating that selecting bulls with the ability to transmit higher butterfat tests has been a most important reason for the increases in total butterfat in this herd. The daughters of the first sire figured to a mature basis and milked three times daily for 365 days averaged 19,059 pounds of milk; second sire, 19,613 pounds; third sire, 16,494 pounds; fourth sire, 20,490 pounds; and fifth sire, 19,958 pounds of milk. In other words, improvement has come more rapidly through higher fat

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tests, rather than by increasing milk. To those who are familiar with the strain on high producing cows the question may arise as to whether there may not be a physical limit somewhere above the present level of our good cows, beyond which it is going to be extremely difficult to maintain production, regardless of genetic inheritance.

Although the improvement in type of the Beltsville herd has never been a definite objective, it is interesting to note that marked changes in conformation that have been for the better have taken place during the past ten years. Udders are less pendulous; in fact in shapeliness and strength of attachment, they are far ahead of those noted some ten years ago. The general conformation is more symmetrical and the appearance of the herd more pleasing. These and other changes have doubtless come about as a result of proven bulls being available in families and herds where type has been an objective. In other words Beltsville demonstrates that high production is not necessarily associated with poor individuality—a theory that was at one time quite popular in certain dairy cattle breeding circles.

Perhaps the most revolutionary feature of the work at Beltsville is the practice of using proven sires regardless of their pedigree or family background. Although no report on this phase of the government program has been published, those making herd sire selections freely admit that if a bull stands first in the tests to which they submit him, which include a careful examination of his daughters and their records, as compared with their dams, and with full consideration for management conditions, he may be chosen for this important breeding program, regardless of his pedigree and the records of his ancestors.

Evidence to support this point is found in the latest sire, selected in Iowa and whose dam is untested. Even though his dam has no record, this sire was given first call. In the opinion of these investigators, it is not necessary to look back of a sire when his breeding value has been definitely established.

If the additional work in this field continues to support this point of view, there is a possibility that it may revolutionize the use of pedigrees in the breeding of dairy cattle, for obviously, this theory discounts the value of ancestral background, *except in the case of untried animals*. And, of course, young untried sires are going to continue to make up the bulk of the bull trade, with the result that pedigrees will doubtles continue to play an important part in breeding programs but with the close-up ancestors re-

ceiving more attention than ever before.

Obviously, depending upon proven sires regardless of their ancestry has reduced the amount of attention given to line-breeding or to breeding along definite family lines at Beltsville. Furthermore, according to those in charge the results to date would indicate that the work has not suffered because of breaking away from the time-honored idea of breeding along family lines. Cattle breeders may well ponder over the fact that the general acceptance of this idea may make some very important changes in some of the so-called fundamental principles of breeding.

Without attempting to detract in any way from these records, it should be pointed out that cows are milked three times a day for the full 365-day period, and that factors to figure all records to a mature equivalent basis are used.

All heifers are tested during their first lactation, and again at maturity. The production during the remainder of their lives is not considered in the breeding studies at Beltsville. In an effort to control conditions, cows are not pastured during their test years, but are kept in large box stalls.

Breeders who are following a program of continuous testing quite naturally wonder just how much allowance, if any, should be made between cows on continuous tests and those maintained under Beltsville conditions.

Governmental investigators believe that the best record that a cow makes under standarized environmental conditions is as good a measure of her inherent ability for producing level as is a continuous lifetime record under herd conditions. They believe that the lifetime record is often a matter of good fortune in escaping injuries and disease for the individual animal and that many animals possessing a splendid inheritance for producing capacity never have an opportunity to produce up to their inherent ability in more than one or two lactation periods because of injuries, sickness or other unfavorable conditions.

They believe too, that the gauging of a sire's inheritance on the comparison of the sire's daughters' first calf records with the dam's lifetime record may lead to erroneous conclusions. In their opinion that method of comparison favors the sire, since on the average a first calf heifer is more free from injuries and disease than at any time in her subsequent life, while the average of a number of lactations for the dam is likely to be lowered by some lactations that were made under unfavorable conditions. They hold that the most rigorous test for gauging the inheritance

of a sire is a comparison of the daughters' best record with the dams' best record, where both have had the same opportunity to produce up to their capacity.

The governmental investigators have tested each and every female that has been born and developed to producing age, regardless of her appearance or producing ability. The genetic analysis is therefore based on unselected and unculled groups, all of which have been fed, milked and handled under uniform conditions. Only the dams of the original foundation herd, which were all daughters of well known bulls, and the sires to which these females have been bred, have been selected. Consequently, any improvement in producing ability of the herd should be considered the result of breeding alone.

Beltsville does not believe in "nicking" in the sense in which the term is usually interpreted by the breeder. They believe that a sire that has proved by the breeding test that he possesses an inheritance that enables him to transmit uniformly high levels of production in one herd, will continue to transmit the genes determining high levels of production in any herd in which he may be used. This they say is proved by the success of the unrelated sires that they have used in the experimental herd, and that it appears to indicate that all great transmitting sires, at least within a breed, possess similar germ plasm, in so far as producing capacity is concerned.

They believe that the reason a given sire may make a somewhat different showing in different herds as measured by the producing ability of his daughters, is due to differences in environmental conditions under which the daughters are tested in several herds and to differences in the degree of heterozygosity of the dams with which they are mated in the different herds, for the genes determining level of producing ability. They also believe that the idea that sires do better in one herd than in another is sometimes due to incomplete data on the producing ability of all the daughters sired in one of the herds in which the sire was used.

When questioned as to any other important points brought out in these studies, the statement was made that earlier maturing characteristics are being noted. Heifers are calving earlier and producing better at younger ages than formerly.

Another practice that should be of interest is that of using young bulls for breeding heifers. Since adopting this plan, heifers have been kept freer from disease and have been gotten in calf earlier.

Are They Vermin? (VIII)

E. Lawrence Palmer
Prof. of Rural Education, Cornell University

LONG-EARED OWL

Asio wilsonianus
(Lesson)

LONG-EARED OWL

Description—Length, 16 inches; wing spread, 3½ feet; weight, 11 ounces. Female generally slightly larger than male. About crow's size. Long ear tufts. Darker than owls of similar size. Flight, light and uncertain. Resembles screech owl and great horned, but intermediate in size.

Where found—During breeding season a bird of the woods, but in migration may be found almost anywhere.

Range—Breeds central British Columbia to Newfoundland and south to California, Texas, and Virginia. Winters in southern part of range and south to Florida and central Mexico.

Relations and life history—Closely related to short-eared owl. Family Strigidae. Breeds in dark woodland. Nest of sticks, or a deserted crow's nest in a tree, rarely on ground. Eggs, 3 to 7, 1.75 by 1.5 inches, smooth and white; laid about April or May, one egg every other day. Incubation, 21 to 30 days. Young, downy and helpless when hatched; remain in nest about 25 days. First winter plumage darker than that of adults.

Behavior—Food, almost exclusively mice. Of 107 stomachs examined, 84 contained mice; 5, other mammals; 15, small birds; 1, bobwhite; 1, insects; and 4, nothing. Other studies show a larger proportion of mouse food. Often congregates where there is an abundance of their food. Migrate in considerable numbers in winter, spending time from December to March in south.

Reaction to heat, light, and moisture—Essentially a night owl but may be active at dusk or on very dull days. Migrates in winter more than most species; gives whining cry and a regular caterwaul.

Relation to man's interests—Justly protected in New York State. No record of poultry destruction and very few records of harm to game species. Splendid records in mouse and rodent destruction. Not vermin.

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For the Farmer's Library

These books are recommended as outstanding in their field:

Pork Production

By William W. Smith, Professor of Animal Husbandry, Purdue University. Published by the Macmillan Co. $3.75.

(See Farmers Digest, September, 1939)

Feeds and Feeding

By F. B. Morrison, Professor of Animal Husbandry and Animal Nutrition, and head of the Animal Husbandry Department, Cornell University. Published by the Morrison Press. $5.00.

(See Farmers Digest, October, 1939)

Farm Meats

By M. D. Helser, B.S.A., M.S., Professor of Animal Husbandry, Iowa State College; Chief in Meat Investigation, Iowa Agricultural Experiment Station. Published by the Macmillan Co. $2.90.

(See Farmers Digest, January, 1940)

Beef Cattle

By Roscoe R. Snapp, Associate Professor of Animal Husbandry, University of Illinois. Third edition is to be published this fall. Published by John Wiley & Son, Inc. $4.00.

(See Farmers Digest, November, 1939)

Dairy Cattle and Milk Production

By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Division of Dairy Husbandry, University of Minnesota, and formerly Professor of Dairy Husbandry, University of Missouri. Published by the Macmillan Company. $3.60.

(See Farmers Digest, February, 1940)

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INDEX

d Cattle

Calves Prefer Oats ..... Oct., 1938
Cure of the Herd Bull ..... Nov., 1938
Limestone Feeding ..... Nov., 1938
Application of Breeding Laws ..... Dec., 1938
Importance of Breeding Matrons .. Jan., 1939
Feeding Calves for Baby Beef ..... May, 1939
Performance-Testing Beef Sires .... Oct., 1939
Importance of Grade ..... Nov., 1939
Cost Accounting for the Feed Lot .. Dec., 1939
Watch Them Walk ..... Dec., 1939
Selecting, Dressing and Cutting Veal . Jan., 1940

nservation

Bedding with Funnels ..... June, 1939
Farming the Land and Keeping the Soil, June, 1939
Red Paradox of Conservation ..... July, 1939
SCC's Work in Conservation ..... July, 1939
The Farmer as a Conservationist .. Sept., 1939
Do You Have a Gully ..... Oct., 1939
White Top, Enemy Number One ... Nov., 1939
Nebraska's Program for Weed Control, Dec., 1939
Grass to Soil or Soil to Grass ..... Jan., 1940

ops

Artificial Drying of Roughage ..... Nov., 1938
Story of Yorkwin Wheat ..... Nov., 1938
Made-to-Order Corn ..... Nov., 1938
Nutrients, Not Tons per Acre ..... Nov., 1938
When Wheat Follows Soybeans .... Nov., 1938
Streamlining a Rotation ..... Nov., 1938
Clover Farmer ..... Dec., 1938
Flax as a Gulf Crop ..... Dec., 1938
Winter Barley ..... Dec., 1938
Inoculation for Legumes ..... Dec., 1938
When Buying Hybrid Corn ..... Dec., 1938
Good Crop for Low Land ..... Dec., 1938
Birdsfoot Trefoil ..... Dec., 1938
New Blight-Resistant Milo ..... Jan., 1939
Sea Island Cotton ..... Feb., 1939
Fighting Stem Rust ..... March, 1939
Seed Treatment ..... March, 1939
High Quality Roughage ..... March, 1939
High Quality Alfalfa ..... March, 1939
Hybrid Grain Sorghum ..... March, 1939
Growing Grass for Seed ..... March, 1939
Grass and Clover Seed Cost Money April, 1939
Depth of Moisture and Yield of Wheat, May, 1939
Chemistry Weeds the Oats ..... June, 1939
Prussic Acid in Sorghum ..... June, 1939
Birdsfoot Trefoil ..... July, 1939
Grass Farming System ..... July, 1939
Curing Hay in the Barn ..... July, 1939
Doubles Protein Yield ..... Aug., 1939
Green Manures ..... Aug., 1939
Seed Harvest ..... Aug., 1939
Raising Ladino Clover ..... Aug., 1939
Hairy Vetch in Corn ..... Aug., 1939
Air-Conditioned Hay ..... Aug., 1939
How to Harvest Flax ..... Aug., 1939
Enriching Timothy with Nitrogen .. Sept., 1939
Cover Crops Increase Yields ..... Oct., 1939
It Pays to Fallow for Alfalfa ..... Oct., 1939
Domestic Rye Grass ..... Nov., 1939
Late Grazing Winterkills ..... Nov., 1939
Fertilizing the Wheat Crop ..... Nov., 1939
Smooth Brome Grass ..... Dec., 1939
Florida's Sugar Bowl ..... Dec., 1939

Dairy Cattle

Why Some Calves Die Young ..... Nov., 1938
Artificial Insemination Progress ... Dec., 1938
She Lost Two Quarters, But ..... Jan., 1939
Improving the Curd Size of Milk .. Jan., 1939
Milking Shorthorn Cow ..... Jan., 1939
Bang's Disease ..... Jan., 1939
Blood Transfusions for Calves .... Feb., 1939
Brown Swiss Cattle ..... Feb., 1939
Taking the Bull Visiting ..... Feb., 1939
Calf Raising Problems ..... Feb., 1939
Trim Your Bull's Feet ..... Feb., 1939
Milk in Gallon Jugs ..... March, 1939
Cleaning Gutters No Chore ..... March, 1939
Good Doers Make Good Milkers ... April, 1939
Medal Sire Cost $52.50 ..... April, 1939
Inheritance of Milk Secretion ..... April, 1939
Selection of a Herd Sire ..... April, 1939
Artificial Breeding Results ..... May, 1939
Some Like It Hot—Some Like It Cold, May, 1939
Sex-Predetermination Experiments . June, 1939
Improving Milk Color ..... June, 1939
Trichomonad Disease ..... July, 1939
Calf Feeding ..... July, 1939
Milk Costs and Prices ..... Aug., 1939
Sun Spots That Damage Cattle .... Sept., 1939
Air-Conditioning a Calf Barn ..... Sept., 1939
Endocrinology of Milk Secretion .. Oct., 1939
Off-Flavor Prevention ..... Oct., 1939
Dairy Economics ..... Oct., 1939
Sanitary Care of Milking Machines . Nov., 1939
Development of Dairy Heifers ..... Dec., 1939
Feeding Grass Silage to Dairy Cows . Jan., 1940
Calfhood Vaccination ..... Jan., 1940

Farm Machinery

Lubricating Oil ..... Oct., 1938
Increasing the Farm Water Supply . Oct., 1938
History of Farm Implements ..... Nov., 1938
The Combine Harvester ..... Jan., 1939
Short Cut in Liming ..... Jan., 1939
Anti-Freeze for Tractor Tires ..... Feb., 1939
Pointers for Pumps ..... Aug., 1939
Better Care of Machinery ..... Sept., 1939
Efficient Farm Machinery ..... Dec., 1939
Portable Seed Cleaning ..... Jan., 1940

Fruit

Orchard Irrigation ..... July, 1938
Raising Quality Fruit ..... Sept., 1938
How to Grow Bush Fruits ..... Oct., 1938
Late Keeping Grapes ..... Oct., 1938
Too Many Bruised Apples ..... Oct., 1938
Peach Progress ..... Nov., 1938
Use of Peat Moss in Planting Trees . Dec., 1938
Incubator Fruit Trees ..... Dec., 1938
Citron Being Produced ..... Dec., 1938
Cover Crop for Orchards ..... Jan., 1939
Profitable Pruning ..... Feb., 1939
Dwarf Fruit Trees ..... Feb., 1939
Peach Orchard Development ..... March, 1939
Transporting Trees When in Leaf March, 1939
New Chemical to Control Peach Borer, April, 1939
Fighting Fire Blight ..... April, 1939
Wound Protectants ..... April, 1939
Fertilizing for Fruit ..... May, 1939
How to Save Girdled Apple Trees .. May, 1939
New Method of Apple Propagation .. May, 1939
New Uses for Fruit ..... July, 1939
Contour Planting in Orchards .... Sept., 1939
Flour from Apples ..... Sept., 1939

INDEX

Old-Country Grapes ..... Sept., 1939
Wax Emulsions for Fruits ..... Oct., 1939
Optimum Orchard Age ..... Dec., 1939

Fertilizers

Drilling Fertilizer ..... Sept., 1938
What Are Fertilizers? ..... Sept., 1938
Humus and Fertilizers ..... Sept., 1938
Your Soil's Limiting Factors ..... Oct., 1938
Soil, Fertilizer Action and Plant Nutrition, Oct., 1938
Functions of Organic Matter ..... Oct., 1938
Where to Place Fertilizers ..... Jan., 1939
Boron Deficiency Becomes a Problem Jan., 1939
Keep Manure Piles Wet ..... Jan., 1939
Production of Artificial Manures Jan., 1939
Balanced Plant Nutrition ..... Feb., 1939
Fertilizers for Soybeans ..... March, 1939
Getting the Most out of Nitrogen March, 1939
Side Placement of Fertilizer ..... April, 1939
Fertilized Ponds Produce More Fish May, 1939
Where to Put Fertilizer ..... June, 1939
Fertilizers Boost Corn Profits ..... July, 1939
Fixed Nitrogen Comes of Age ..... Aug., 1939
Potash Fertilizers ..... Sept., 1939
How to Feed Crops ..... Sept., 1939
Lime and Fertilizer ..... Oct., 1939
Fertilizing without Danger of Injury Oct., 1939
New Citrus Varieties ..... Nov., 1939
Color and Quality in Apples ..... Nov., 1939
Cooperative Grape Association ..... Nov., 1939
Fertilizer's New Unity Ratios ..... Jan., 1940

Hogs

Feeding and Fattening Hogs ..... Jan., 1939
New Hog Method ..... Feb., 1939
Protein Supplements ..... Feb., 1939
Tether System of Pig Breeding ..... Feb., 1939
Methods Employed in Swine Breeding, March, 1939
Pre-Farrowing Management ..... April, 1939
Ton of Pork Twice a Year ..... April, 1939
Isolation—Insulation ..... May, 1939
Worms, Lice and Mange ..... May, 1939
Marketing and Hog Cycles ..... June, 1939
A Test for Sows ..... June, 1939
Hog Cholera ..... June, 1939
Isolation—Insulation (II) ..... Aug., 1939
Food Demands of the Growing Pig Sept., 1939
Pastures for Hogs ..... Oct., 1939
Pig Finish in Five Months ..... Nov., 1939
Hogs May Harvest Sorghums ..... Dec., 1939
Hints on Hog Raising ..... Jan., 1940

Horses

Minerals and Good Horses ..... July, 1938
Home-Grown Power ..... May, 1939
Handling the Draft Stallion ..... May, 1939
Home of the Thoroughbred Horse ..... Dec., 1939

Pastures

Longer Grazing Seasons ..... June, 1938
Restoring the Range ..... Sept., 1938
Anthrax ..... Nov., 1938
By-Products Profits ..... Dec., 1938
Ultra Violet Lamps for Poultry ..... Dec., 1938
Keep Your Litter Dry ..... Dec., 1938
Developing Pastures in Florida ..... March, 1939
More Grass for Dairy Cattle ..... April, 1939
Deferred System with Rotation Pasture, April, 1939
Mowing Pastures ..... Aug., 1939
Supplemental Pastures ..... Aug., 1939
Sweeping the Pasture ..... Aug., 1939
Greener Pastures ..... Nov., 1939

Poultry

Prolapse and Pickouts ..... March, 1
Baby Capons ..... March, 1
Geese as a Sideline ..... March, 1
Egg Auctions Prove Their Value ..... April, 1
Count Your Chicks Before They Hatch, April, 1
Virginia State Game Farm ..... April, 1
Force Molting of Hens ..... May, 1
Grass Plus Grain for Poultry ..... May, 1
The Nittany Turkey ..... June, 1
Better Range Management ..... June, 1
Ducklings on the March ..... June, 1
Fertile Egg Aids Science ..... July, 1
Sexing is Sound ..... July, 1
The Digestion of Nutrients ..... July, 1
Have We a New Utility Breed? ..... July, 1
Baby Capons ..... Aug., 1
Spotting the Gyppers ..... Aug., 1
Feeding for Confinement Rearing ..... Aug., 1
Smoked Turkey Roll ..... Sept., 1
Feeding for Egg Production ..... Sept., 1
Preserving Egg Quality ..... Sept., 1
Super in the Poultry House ..... Sept., 1
Progress in Incubation ..... Oct., 1
Chicken Pox Vaccine ..... Oct., 1
Gizzard Erosion in Chicks ..... Oct., 1
Manured Poultry Litter ..... Oct., 1
Poultry House Temperatures ..... Nov., 1
Sell Your Feathers ..... Nov., 1
Chicken Money ..... Dec., 1
Care of Layers in Batteries ..... Dec., 1
Double Barrelled Brooding Program Jan., 1
Soaked Oats for Body Weight ..... Jan., 1
Mid-Winter Brooding ..... Jan., 1
Breeding Methods for Commercial Flocks Jan., 1
Uncle Sam Attacks Paralysis ..... Jan., 1

Sheep

More Pounds of Wool per Ewe ..... Jan., 1
Chop Roughage for Lambs ..... April, 1
Sheep Parasites ..... May, 1
What is Size ..... June, 1
Ram Trucks ..... June, 1
Flock Improvement Plan ..... Sept., 1
Drench Your Sheep ..... Oct., 1
The Navajo Sheep Industry ..... Nov., 1
World's Largest Sheep Ranch ..... Dec., 1
Tomorrow in Sheep ..... Jan., 1

Silage

Binder to Cut Alfalfa for Silage ..... Aug., 1
Small Grain Silage ..... Sept., 1
Stack Silage for Bundled Feed ..... Oct., 1

Vegetables

Chemical Soil Fumigation ..... March, 1
Growing Plants without Soil ..... March, 1
New Methods for Tomato Growers March, 1
Fertility for Vegetable Production April, 1
Root Pruning Young Plants ..... April, 1
Disease Resistant Potatoes ..... May, 1
Delayed Spraying of Tomatoes ..... May, 1
A Starter for Tomato Plants ..... June, 1
They Did It Themselves ..... June, 1
Chloropicrin Soil Fumigation ..... July, 1
Pruning Staked Tomatoes ..... Aug., 1
Bacterial Wilt of the Potato ..... Aug., 1
Rain Making ..... Sept., 1
Potato Pioneers ..... Jan., 1

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